ULTIMATE WINDOWS 11 UPGRADE CHECKLIST

#550
OCT 2025

apc

YOUR EXPERT GUIDE
TO TODAY'S TECH

SINCE 1980

19 PRO-QUALITY MONITORS MEGATEST

• **BEST VALUE** • BEST QUALITY • **BEST FOR YOU**

ENHANCE YOUR PHOTOS & VIDEOS WITH AI

BEST FREE & CHEAP OPTIONS FOR PRO RESULTS

WINDOWS 11

All your questions answered

- CAN YOU STILL USE WINDOWS 10 SAFELY?
- CAN YOU CLAIM AN EXTRA YEAR'S SUPPORT?
- HOW DO YOU UPGRADE OLD WINDOWS 10 PCs?

... & MANY MORE!

AUS $11.95 INC GST
NZ $13.90 INC GST
PRINT POST APPROVED:
100000179
ISSN: 0725-4415

NEW!

EXPANDED HOW-TO SECTION

TUNE-UP YOUR TECH

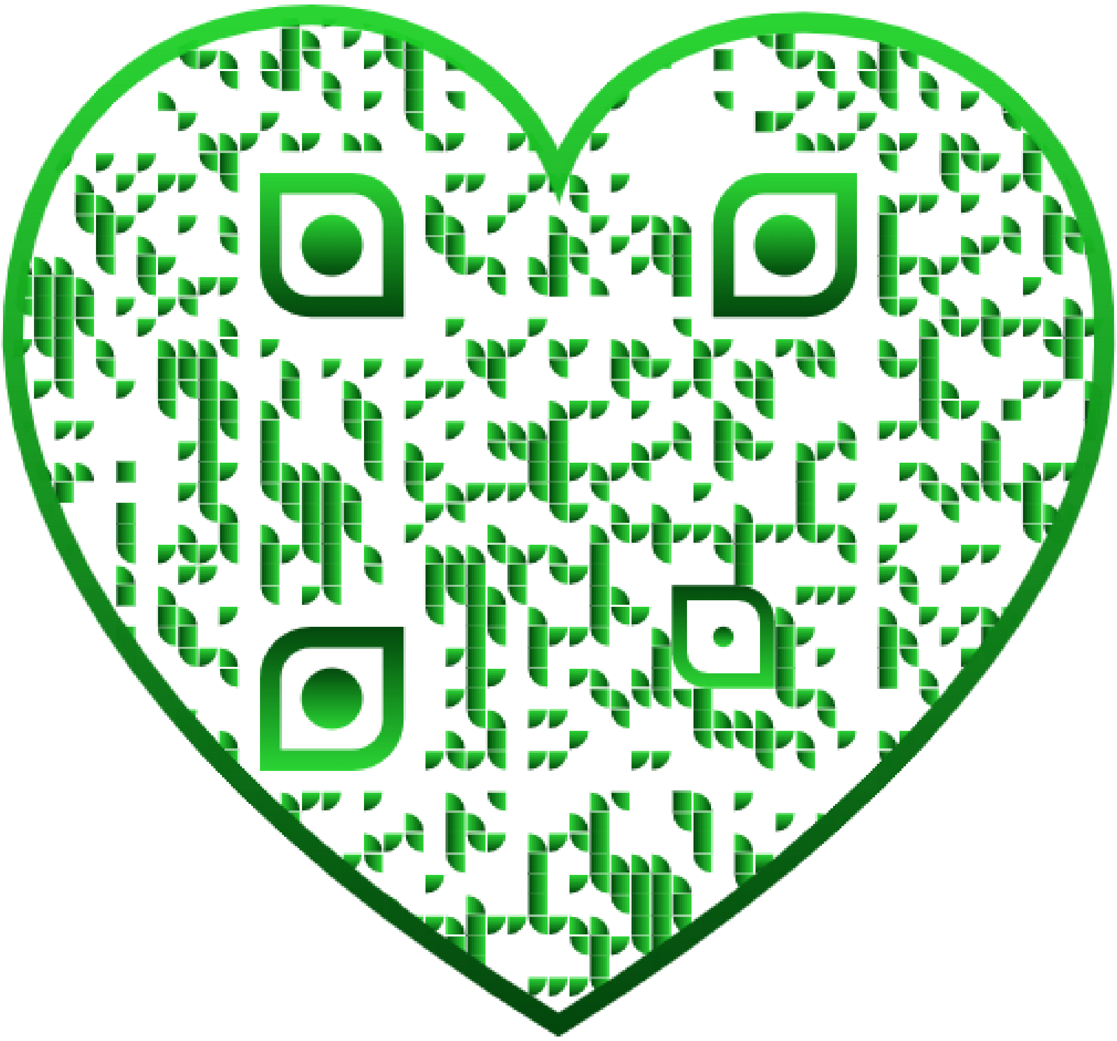
COOL RUNNING

HOW TO STOP YOUR CPU FROM OVERHEATING

LG's DREAMY 5K OLED

WE RECKON THIS IS THE BEST MONITOR IN THE WORLD!

PAGE 30



Vigor2136 Series

2.5GbE WAN High-Speed VPN Routers

DrayTek Aust & NZ
www.draytek.com.au

Ethernet WAN
NBN Ready

Ethernet WAN
UFB Ready

16x
VPN

Gigabit broadband routers with
1 x 2.5GbE WAN port,
1 x Configurable 2.5GbE WAN/LAN port,
3 x GbE LAN ports,
SPI Firewall, 802.11ax Wi-Fi,
16 x VPN tunnels including IPsec,
OpenVPN and Wireguard

Vigor2136ax
(WiFi 6, AX3000)

- Ready to connect to NTD (Network Termination Device) of NBN (Aust) and UFB (NZ)
- 1 x 2.5 Gigabit WAN port with 2 x USB ports for 4G Mobile Fail-Over
- 1 x configurable 2.5 GbE WAN/LAN port (P1)
- 3 x Gigabit LAN ports with 50,000 NAT sessions
- NAT throughput with Hardware Acceleration over 2.3 Gbps
- IPsec VPN throughput up to 390 Mbps (AES 256 bits)
- Object-based SPI Firewall, Content Security Management (CSM), URL/IP Reputation and Port Knocking
- IAM (Identity and Access Management) to enhance security management and user experience
- IPv6 & IPv4
- 802.11ax (AX3000) Wi-Fi up to 574 + 2402Mbps speed (ax model)
- 16 x VPN tunnels, including IPsec, OpenVPN, and WireGuard, with EasyVPN features that simplify VPN setup for effortless connectivity
- 2 x USB ports for 4G Backup, FTP server, network printer or thermometer
- Virtual AP Controller for the deployment of up to 20 wireless VigorAPs
- Wireless Mesh (ax model) up to 7 VigorAPs
- Virtual Switch Controller to manage up to 5 VigorSwitches
- Supports VigorACS 3 (Central Management Software) for remote management
- 2 years back to base warranty

i-LAN TECHNOLOGY

i-LAN Technology Pty Ltd trading as DrayTek Aust & NZ
www.draytek.com.au ☎ (02) 9838 8899 sales@i-lan.com.au

© Copyright 2025 i-LAN Technology Pty Ltd. All rights reserved.

SUBSCRIPTION
ENQUIRIES
(02) 8227 6486
www.techmags.com.au
future@crmaus.com.au

Editorial
Editor-in-Chief: **Ben Mansill** ben.mansill@futurenet.com
Senior Writer, Computing: **Lindsay Handmer**
Senior Journalist: **Shaun Prescott**
Senior Journalist: **Zachariah Kelly**
Group Art Director: **Troy Coleman**

Contributors
Alex Blake, Steve Bonifield, Rowan Campbell, Steve Clark, David Crookes, Tim Danton, Lee Grant, Robert Irvine, Luke James, Alex Kidman, Jon Martindale, Nathaniel Mott, Howard Oakley, Nik Rawlinson, Anton Shilov Abbie Stone, John Strike, Tom Sykes, Mark Tyson, Mark Williams, Joshua Wolens, Mark Williams

Photography
All copyrights and trademarks are recognised and respected

Advertising
auadvertising@futurenet.com

Management
Managing Director: **Neville Daniels**
Commercial Director: **Chris Ferguson**
chris.ferguson@futurenet.com

Printed in Australia by IVE

Distributed in Australia and NZ by Are Direct

ISSN 0725-4415

Future Publishing Australia
PO Box Q1179, Queen Victoria Building, NSW 1230
Corporate Web: **www.futureplc.com**
Email: **apcmag@futurenet.com**
Web: **www.apcmag.com**

We are committed to only using magazine paper which is derived from responsibly managed, certified forestry and chlorine-free manufacture. The paper in this magazine was sourced and produced from sustainable managed forests, conforming to strict environmental and socioeconomic standards. The manufacturing paper mill holds full FSC (Forest Stewardship Council) or PEFC certification and accreditation.

All contents ©2024 Future Publishing Australia or published under licence. All rights reserved. No part of this magazine may be used, stored, transmitted or reproduced in any way without the prior written permission of the publisher. Future Publishing Limited (company number 2008885) is registered in England and Wales. Registered office: Quay House, The Ambury, Bath BA1 1UA. All information contained in this publication is for information only and is, as far as we are aware, correct at the time of going to press. Future cannot accept any responsibility for errors or inaccuracies in such information. You are advised to contact manufacturers and retailers directly with regard to the price of products/services referred to in this publication. Apps and websites mentioned in this publication are not under our control. We are not responsible for their contents or any other changes or updates to them. This magazine is fully independent and not affiliated in any way with the companies mentioned herein.

If you submit material to us, you warrant that you own the material and/or have the necessary rights/permissions to supply the material and you automatically grant Future and its licensees a licence to publish your submission in whole or in part in any/all issues and/or editions of publications, in any format published worldwide and on associated websites, social media channels and associated products. Any material you submit is sent at your own risk and, although every care is taken, neither Future nor its employees, agents, subcontractors or licensees shall be liable for loss or damage. We assume all unsolicited material is for publication unless otherwise stated, and reserve the right to edit, amend, adapt all submissions.

Privacy statement
If you provide information about yourself this will be used to provide you with products or services you have requested. We may supply your information to contractors to enable us to do this. Future Publishing Australia will also use your information to inform you of other publications, products, services and events. Future Publishing Australia may also give your information to organisations that are providing special prizes or offers and are clearly associated with the Reader Offer. Unless you tell us not to, Future Publishing Australia may give your information to other organisations that may use it to inform you of other products, services or events. If you would like to gain access to the information Future Publishing Australia holds about you, please contact us.

FUTURE
Connectors.
Creators.
Experience
Makers.

Future plc is a public company quoted on the London Stock Exchange (symbol: FUTR)
www.futureplc.com

Chief executive **Kevin Li Ying**
Non-executive chairman **Richard Huntingford**
Chief financial officer **Sharjeel Suleman**
Tel +44 (0)1225 442 244

Screens and things

APC monitors the monitors.

Hi everyone, I hope the year is going well for you. Team *APC* is doing just fine. We've plenty of nice new tech to play around with, and that helps us sit comfortably at above average happiness levels.

Speaking of sitting comfortably, and we were, being planted in front of a monitor you love is one of PCing's sweetest joys. A monitor is the sort of thing you settle in with and accept as something nice that never changes, but monitors are one of the fastest evolving areas of PC tech, and there are a lot of screens out there that are worth looking into (pun intended).

We hauled 19 of them into the Labs this issue for a rigorous group test, so you know where things are at. These aren't gaming monitors (though many will perform admirably at that), because a gaming monitor Labs deserves its own multi-page feature. No, these are the 'everyday' screens we use for, well, everything. Screens that would do a fine job in a home or work office, or for students, and many that will bring great pleasure to creative professionals, too.

Our Labs encompasses 24in, 27in and bigger 32/34in sizes. These are the most popular type of screens. Above 34in things start to really diversify into a huge variety of sizes and aspect ratios. We can tackle those in another Labs later. Remember too that running dual or even triple monitors is a treat you probably don't fully appreciate until you've tried it, so even the humble 24-inchers offer great options for running multiple screens, and setting that sort of configuration up is a breeze.

This Labs also serves as a great tech updater, where we explain in detail where the tech is at and the minimum specs you should consider when shopping for a new screen.

Elsewhere at *APC* HQ, the team is in an alert posture for the impending end of Windows 10 official support. That's coming up on October 10th, in case you somehow missed all the fuss we've been making about that recently. If you're still running Windows 10 and haven't made a decision yet about what to do, this is important stuff! Have a read of our feature that starts on page 42. This is the most down to basics article we've done on the topic, so, as they say, if you only read one Windows 10 EOL guide this year, make it *APC*s. ■

MEET THE TEAM Along with Australia's best tech journos, our core crew work hard to make *APC* a great read every month.

LINDSAY HANDMER
Lindsay has been writing for *APC* for over a decade and loves nothing more than spending all day every day benchmarking the latest hardware.

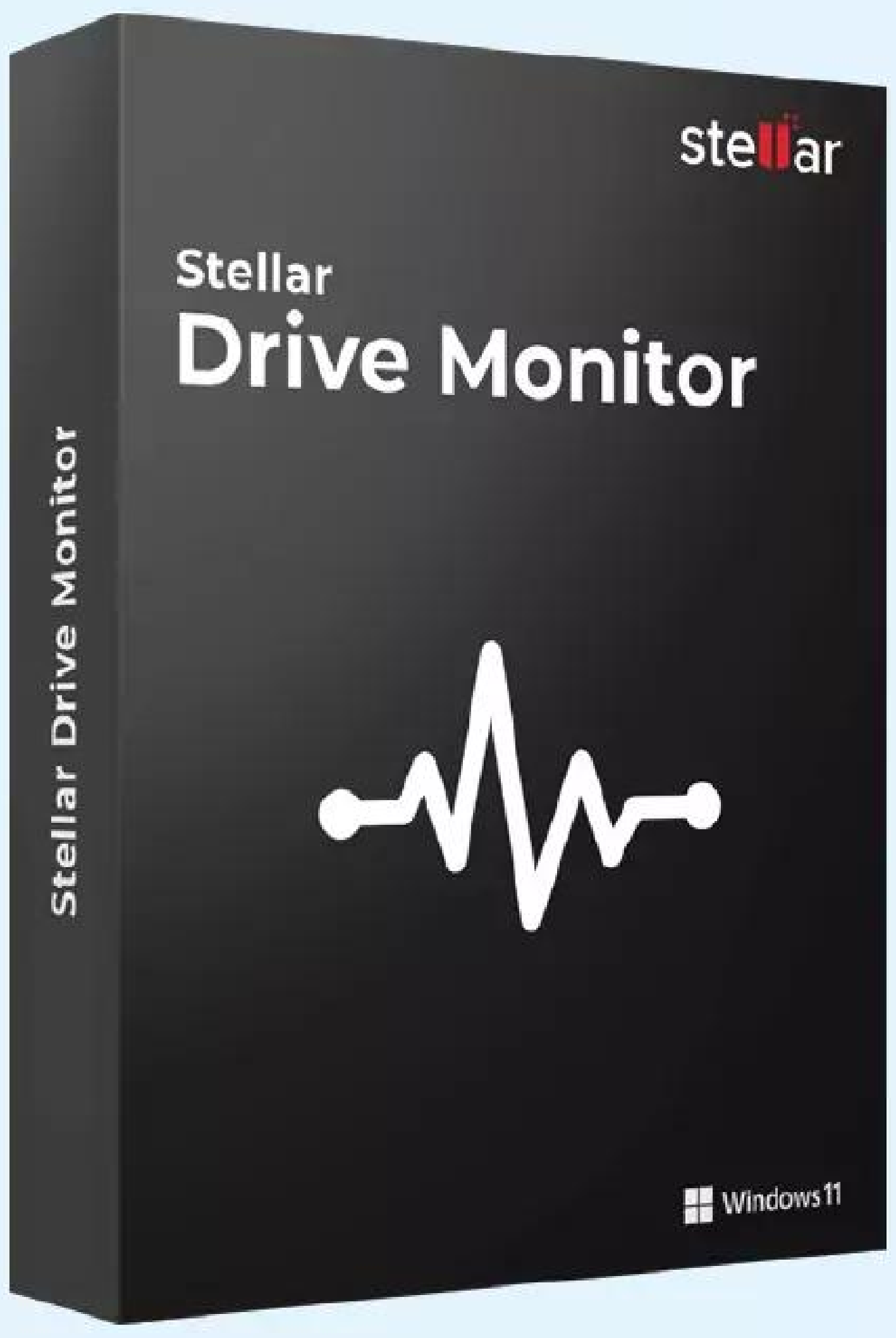
ZACHARIAH KELLY
Zac's been pulling computers apart since he was 12, and focuses on peripherals and monitors for *APC*. Zac also writes for *TechRadar*.

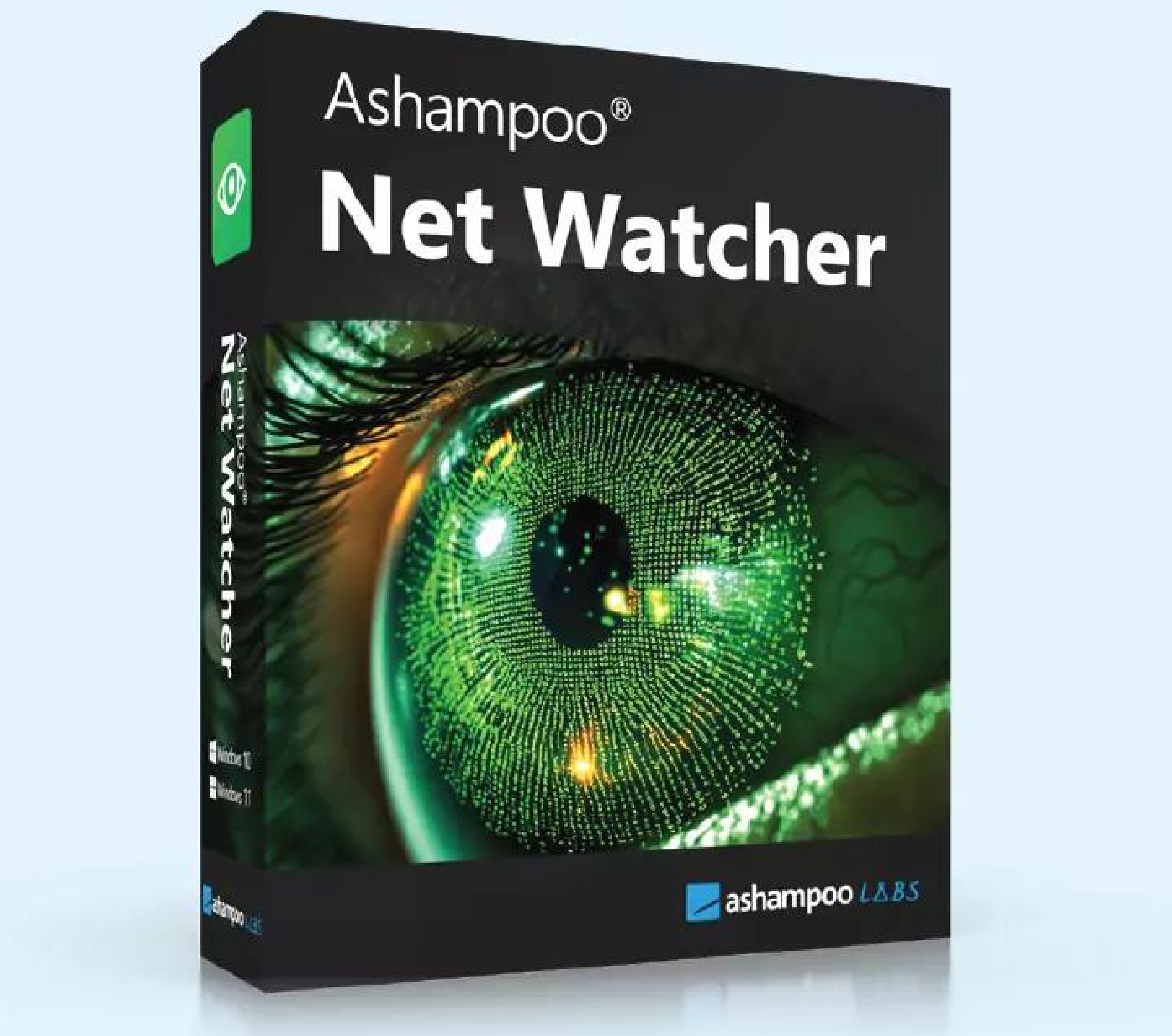
SHAUN PRESCOTT
Shaun has been covering the games and tech industries for 15 years. He also writes for *PC Gamer*, *GamesRadar*, *TechRadar* and *Tom's Guide*.

Exclusive downloads

Your free full-version apps as a thanks for reading *APC*.
These exclusive downloads will only be available for a limited time,
from 22/09/25 to 09/11/25.

Download these *APC* exclusives free from: **www.apcmag.com/exclusives**





audials
one
2025
audials one 2025
SPECIAL EDITION

STELLAR DRIVE MONITOR

MONITOR HARD DISK'S TEMPERATURE, PERFORMANCE, AND HEALTH.

Stellar Drive Monitor is a powerful software that continuously checks the storage drive's overall performance. It detects and alerts the user about any anomaly on the hard drive. This amazing hard disk health check software provides real-time information on the temperature, performance, and health of a drive. The software is not only a hard drive health check tool but also keeps an eye on each hard drive partition. It provides information like partition name, health status (healthy or failing), total storage capacity, free space as a percentage of total space, and more.

Stellar Drive Monitor is a comprehensive hard drive health check tool that facilitates hard disk scanning for bad sectors. It thoroughly scans the selected drive to find any bad sector present on the drive.

This *APC* exclusive provides one year of use of the full version. Register at: tinyurl.com/APC550stellar

ASHAMPOO NET WATCHER

NET WATCHER SHOWS YOU EXACTLY WHAT'S HAPPENING ON YOUR LINE – IN REAL TIME!

During the test, you'll be able to observe the performance of your connection in real-time. Minimum, maximum, and average ping values are recorded and presented in an easy-to-read graph. You'll easily identify the stability of your connection over time, including any interruptions. Net Watcher also tracks the number of connection errors to provide a realistic assessment of network issues.

Ashampoo Net Watcher also displays the exact route (hops) your connection takes to reach the target server. This allows you to quickly determine whether the issue is within your home network, with your ISP, or somewhere along the way to the server. It's the perfect tool to collect solid facts when contacting your provider or to better understand your own network.

AUDIALS ONE 2025 SPECIAL EDITION

DISCOVER AND DOWNLOAD MUSIC.

Thanks to the enormous range of music available on video portals such as YouTube or Vimeo, users can discover almost any song or music video. Instead of taking up hard disk space with downloaded files, this content can be added to playlists using simple links. This creates a personal, always accessible music collection that remains flexible and storage-free without compromising on quality or variety. Current and popular chart hits can be downloaded as files. This allows you to listen to your favourite songs offline, regardless of an Internet connection.

Endless selection and always the right music thanks to current artists, tracks, and regular charts. With your "Music Zoom", you can immerse yourself further in the infinite world of music!

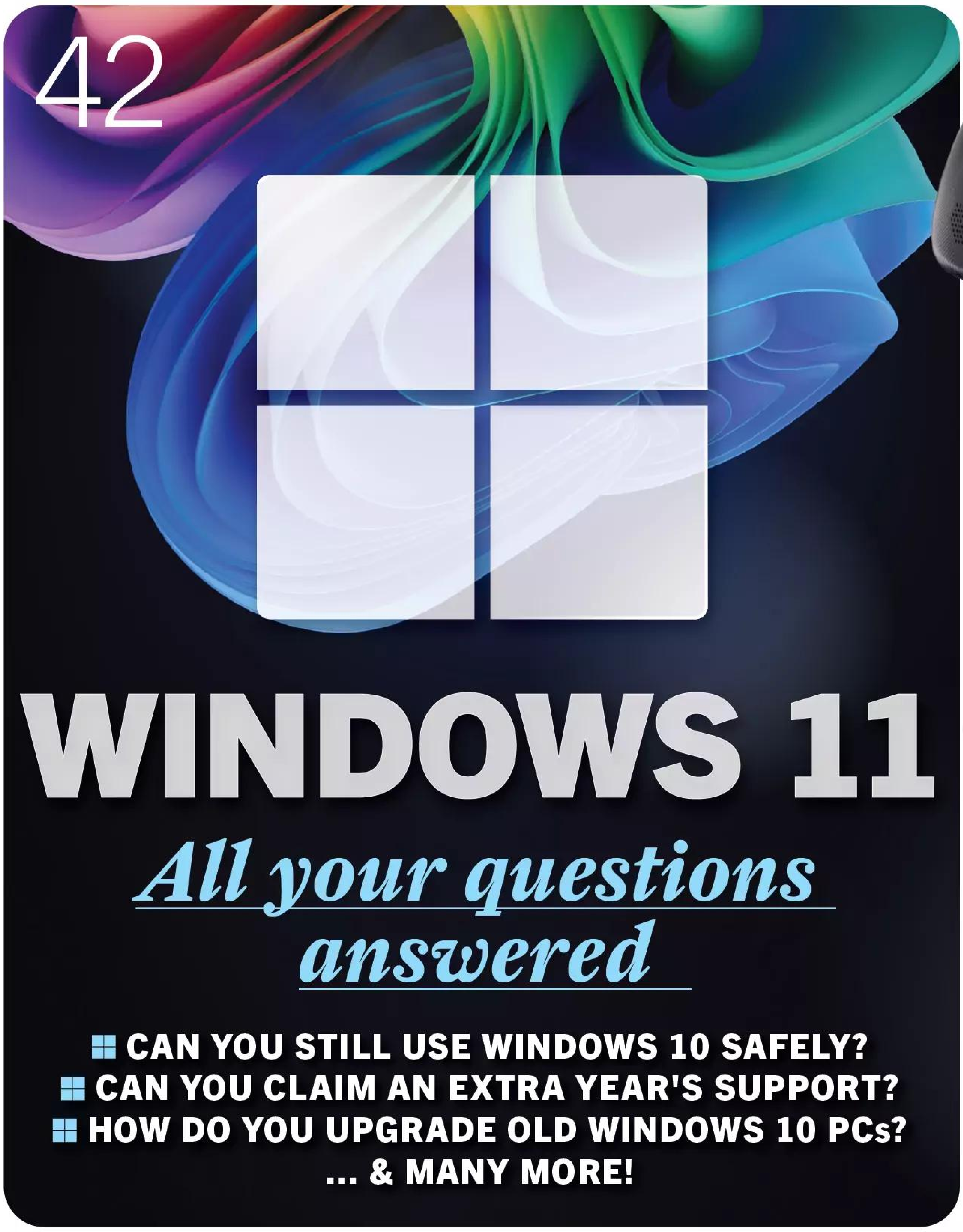
DISCLAIMER Future Publishing is not the licensor of the exclusive software or any documentation included with it. Rather, Future is merely a distributor of the software, and your use of the software is subject to any accompanying third-party licence terms. You must carefully read and comply with any such third-party licence terms, together with all instructions and README files that come with the software. Accordingly, to the maximum extent permitted by law, all software is provided by Future 'as is' and without warranty either express or implied, and Future will not be liable for any damage that you may incur as a result of using any software downloads. You should back up any important system and data files before using any downloaded software. We recommend that you do not use the exclusive software on a production machine. Nothing in this disclaimer excludes any warranty that may be implied by statute, which may include the Trade Practices Act. While we have taken all reasonable steps to check the software downloads for viruses, we cannot guarantee that it is free from viruses or other harmful code and you should check each download using a virus scanner complete with the latest antivirus updates before use.

THE MOST IMMERSIVE VEHICULAR COMBAT EXPERIENCE
WAR THUNDER
2500+ PLAYABLE VEHICLES | 100+ LARGE-SCALE MAPS | INTENSE PVP & PVE ACTION
GET YOUR BONUS
WARTHUNDER.COM/FLY
Windows
STEAM
Mac
oculus
VIVE
PS4
XBOX ONE
PS5
XBOX SERIES X|S
Gaijin entertainment
12
www.pegi.info

© 2009—2018 by Gaijin Entertainment.
All rights reserved.

CONTENTS

This month in *APC*



42

WINDOWS 11

All your questions answered

- CAN YOU STILL USE WINDOWS 10 SAFELY?
- CAN YOU CLAIM AN EXTRA YEAR'S SUPPORT?
- HOW DO YOU UPGRADE OLD WINDOWS 10 PCs?

... & MANY MORE!

28

30

35

48 **Enhance your photos and videos with AI**
Nik Rawlinson explores the tools that use artificial intelligence to transform your images and video footage.

52 **Keep your cool**
Darien Graham-Smith explores why thermal management is so important, and how to keep your own processor running cool.

> “If I have an app that can reach out to other instances of itself on local devices, I need to be certain that the data being shared is acceptable to me.”

Jon Honeyball - **One More Thing**
page 15

ON THE COVER

42
ULTIMATE WINDOWS 11 UPGRADE CHECKLIST
#550
apc
YOUR EXPERT GUIDE TO TODAY'S TECH
SINCE 1980
48
ENHANCE YOUR PHOTOS & VIDEOS WITH AI
BEST FREE & CHEAP OPTIONS FOR PRO RESULTS
62
19 PRO-QUALITY MONITORS MEGATEST
• BEST VALUE • BEST QUALITY • BEST FOR YOU
42
WINDOWS 11
All your questions answered
CAN YOU STILL USE WINDOWS 10 SAFELY?
CAN YOU CLAIM AN EXTRA YEAR'S SUPPORT?
HOW DO YOU UPGRADE OLD WINDOWS 10 PCs?
... & MANY MORE!
90
NEW! EXPANDED HOW-TO SECTION
TUNE-UP YOUR TECH
COOL RUNNING
HOW TO STOP YOUR CPU FROM OVERHEATING
LG's DREAMY 5K OLED
WE RECKON THIS IS THE BEST MONITOR IN THE WORLD!
PAGE 30
30

INSIDE

Technotes

08 News
Stay up to date with all the important news in tech

10 Tech brief
ChatGPT users revolt over GPT-5 release & How AMD builds entire chip families from just 4 dies

12 System news
Intel’s big shake-up

15 Two bits
Intel is once again being thrown a lifeline – how did we get here?

14 End user
Aussie game changes the industry

15 One More Thing
A new Wi-Fi standard is coming to town

16 Gadgets
The latest gear and gadgets that have our attention

22 Futures
Batteries that eat carbon dioxide

The Lab

27 Alienware 16 Area-51
28 Lenovo Legion Go S (SteamOS)
29 Asus ROG Crosshair X870E Apex
30 LG UltraGear 45-inch OLED
31 Dell S2725DC Monitor
32 Contour Design Unimouse
32 Samsung Galaxy Fit3
33 SteelSeries Rival 3 Wireless
33 OnePlus Buds 4
34 Zoner Studio
35 Corsair Scimitar Elite WL SE
36 Nothing Phone (3)

Software

38 PhotoDemon 2025.4, Ocenaudio 3.15, Thunderbird 139, Fences 6
40 Paste 5
41 Fillably

The Lab feature

62 Monitor megatest
24in MONITORS
68 AOC 24B3HA2 68
68 Asus ZenScreen MB249C
69 Eizo FlexScan EV2410R 69
27IN MONITORS
70 Acer Vero CB272K 70
70 BenQ GW2790QT 70
71 Dell 27 Plus 4K USB-C 71
71 Eizo FlexScan EV2740X 71
72 HP Series 5 Pro 527pq 72
72 Iiyama ProLite XUB2797QSNP
73 MSI Pro MP275QPDG 73
73 ViewSonic ColorPro VP2788-5K
74 Asus ZenScreen Smart Monitor MS27UC
75 BenQ DesignVue PD2730S
32/34IN MONITORS
76 Acer SH322QU 76
77 HP P34hc G4 Curved Monitor
77 MSI Modern MD342CQPW
78 Philips 34B2U6603CH
78 ViewSonic VG3457CV
79 Iiyama ProLite XCB3497WQSNP

Features

42 Windows 11 questions answered
48 Enhance your photos and videos with AI
52 Keep your cool - CPU cooling explained
56 5 years of Apple silicon

PC Builder

82 A-list
The best products on the market
85 Market watch
Our spotlight on the PC market
86 Blueprints
Value- and performance-driven hypothetical builds

How to

90 Manage Windows notifications on your PC
93 **What’s the fuss about:** Bing Video Creator
94 Browser tips
96 Expert tips for Windows
97 Make Office better
98 Customise toolbars in macOS
100 Do more with your smartphone

Downtime

102 Gaming reviews
The games we’re playing

110 Game changer
Kingpin: Life of Crime

110 Retro
Amstrad PCW 8256

114 Know How
Create your own AI chatbot

TECHNOTES

Everything you need to know from the month in tech

AI child safety dangers exposed

META IMPLEMENTS NEW RULES FOR ITS AI AFTER DISTURBING CHILD SAFETY REPORT.

Meta has announced it's updating its rules and training processes for its AI chatbots after a controversial *Reuters* report published earlier this month shed light on serious child safety issues. The report revealed disturbingly loose policies outlining how Meta's chatbots can interact with and describe minors, particularly concerning romantic or sexual conversations.

The situation worsened when Reuters published a second report revealing that Meta had also allowed AI chatbots impersonating celebrities to proliferate on its platforms. These "parody" chatbots were caught sharing explicit messages and generating adult images of Taylor Swift, Selena Gomez, Scarlett Johansson, and Anne Hathaway. Most of the bots were user-created, but at least a few were made by a Meta employee, including chatbots impersonating Taylor Swift and Formula One driver Lewis Hamilton.

CORSAIR
CORSAIR
VENGEANCE RGB PRO

Corsair

32GB of RAM on track to become the standard

STEAM SURVEY INDICATES SHIFT.

Valve's Steam Survey data shows we are on the precipice of a major change in the computing landscape. The latest such survey shows that 32GB of system RAM looks set to become the most popular configuration among Steam gamers in mere months.

Looking at the Steam Survey data we can see that the percentage of users with 16GB of RAM has steadily declined from 43.12 to 41.67% over the last six months. Meanwhile, 32GB users have inexorably grown from 32.85 to 35.42% of the Steam gaming populace.

We'd expect the impetus behind this crossover to be those buying new machines moving up a level, falling DDR5 prices, and the well-publicised demands of modern AAA games titles.

Getty

AI's soaring energy use is causing skyrocketing power bills

U.S. reporting spikes in energy costs of up to 36%.

Tech companies are selling a vision of a world in which you can ask their AI for advice on what to cook, wear, and do with your free time. As for who's paying for the massive amounts of electricity used in the course of answering those questions, well, the answer is "us" as consumer electricity prices around the world are already rising due to power grids that are ill-prepared for the sudden spike in demand.

Newsweek reports that increased consumption from data centres in the U.S. where most are based, already contributed to a 6.5% increase in energy prices between May 2024 and May 2025. And those numbers are expected to rise as tech companies continue to build out their AI-related infrastructure. "To keep pace, utilities are increasingly relying on aging fossil fuel plants to generate enough electricity to meet the crushing demand," *Newsweek* says.

That incessant retrieval of the sum of digitally accessible human knowledge has other consequences – which is why one scholar dubbed AI crawlers a "digital menace" – but right now we're focused on the amount of energy those operations require. And constantly fetching all that information is merely the first step in the process of incorporating it into the AI's dataset.

It's no wonder that Lawrence Berkeley National Laboratory's 2024 United States Data Centre Energy Usage Report (PDF) for the U.S. Department of Energy included a figure on data centres' electricity use that showed a "compound annual growth rate of approximately 7% from 2014 to 2018, increasing to 18% between 2018 and 2023, and then ranging from 13% to 27% between 2023 and 2028. That would lead to the industry's power usage representing "6.7% to 12.0% of total U.S. electricity consumption forecasted for 2028," according to the report.

All of which is to say that the current obsession with AI is putting immense demands on electric grids, leading to additional stress on appliances connected to those grids, and increasing the risk of power outages through the use of on-site generators meant solely to protect the facility's equipment without regard for the effect it could have on everyone else – and, per *Newsweek*'s report, we are paying for that privilege.

Intel warns Trump deal could backfire

US GOVERNMENT'S 10% STAKE COULD HURT INTERNATIONAL SALES.

The U.S. government's acquisition of a 10% stake in Intel highlights strategic importance of the company and indicates how important it is to the U.S. government. But the government's new 10% ownership stake could cause problems for shareholders, employees, business partners, and the company's international sales, according to Intel's filing with the Securities and Exchange Commission (SEC).

One of Intel's biggest concerns is its dependence on foreign markets: In fiscal 2024, the company earned 76% of its $53.1 billion revenue outside the United States, a slight decline from the previous year, but still the lion's share. Sales to entities in China contributed 29% of Intel's total revenue, followed by the U.S. with 24.5%, Singapore with 19.2%, and Taiwan with 14.7%. Now that the U.S. government is Intel's largest shareholder, the chipmaker is directly linked to Trump's unpredictable trade and tariff policies, which could unsettle overseas customers and governments.

"Having the U.S. Government as a significant stockholder of the Company could subject the Company to additional regulations, obligations or restrictions, such as foreign subsidy laws or otherwise, in other countries," a statement by Intel reads.

ROBERT N. NOYCE BUILDING
intel
intel

Hackers discover a practical use for AI

FIRST AI-POWERED RANSOMWARE HAS BEEN DISCOVERED.

ESET has announced the discovery of "the first known AI-powered ransomware." The ransomware in question has been dubbed PromptLock, presumably because seemingly everything related to generative AI has to be prefixed with "prompt."

ESET said that this malware uses an open-weight large language model developed by OpenAI to generate scripts that can perform a variety of functions on Windows, macOS, and Linux systems while confounding defensive tools by exhibiting slightly different behaviour each time.

"PromptLock leverages Lua scripts generated from hard-coded prompts to enumerate the local filesystem, inspect target files, exfiltrate selected data, and perform encryption," ESET said in a Mastodon post about the malware. "Based on the detected user files, the malware may exfiltrate data, encrypt it, or potentially destroy it. Although the destruction functionality appears to be not yet implemented."

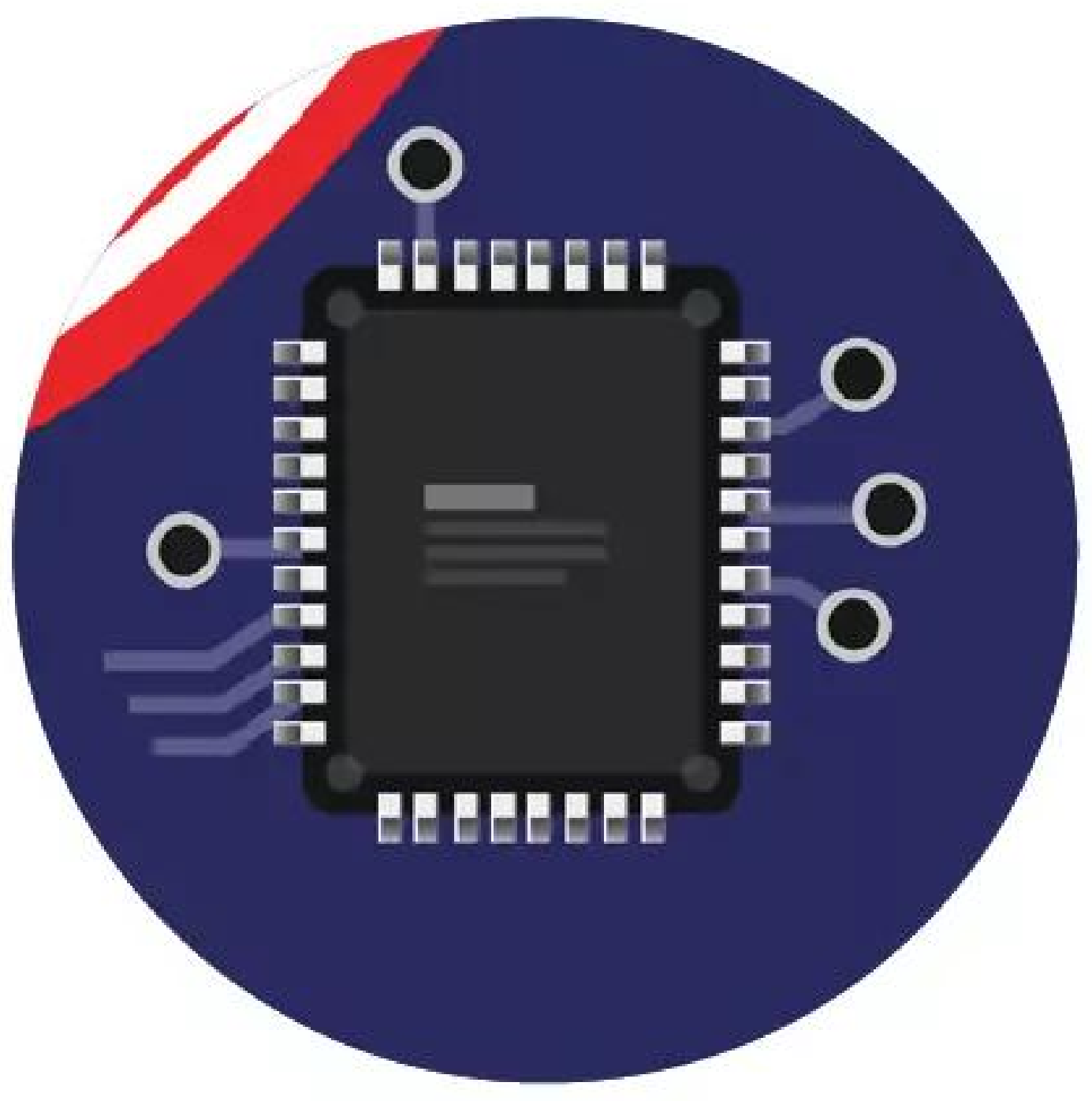
AMD and eSports firm to reveal 1,000Hz gaming monitor

LUDICROUS SPEED PRIMED FOR 2026 DEBUT.

China's AntGamer has teased the release of a 1,000 Hz eSports monitor in 2026 at the official launch of AntGamer's 750 Hz capable ANT257PF monitor. The 1,000 Hz monitor's details are thin on the ground right now. What we can glean from the information at hand is that the upcoming screen will debut using a TN panel, Local Dimming and Black Frame Insertion (BFI) technology.

AntGamer says that it has published a technical white paper with AMD. "This afternoon, Ant Esports held a 1,000fps eSports press conference, jointly releasing a 1,000fps eSports white paper with AMD, along with the specs required for the corresponding games."

Pixel peeping one of the slides, we see games supported at these ludicrous refresh rates include eSports staples *CS2* and PUBG.



China plans state-backed brain chip blitz

AIMS TO BEAT MUSK'S NEURALINK IN MIND CONTROL.

China has just drawn its battle lines in a new frontier of computing. In August, the government published a sweeping policy document ("Implementation Plan for Promoting Innovation and Development of the brain-computer interface (BCI) Industry") laying out its ambition to build an internationally competitive BCI industry within five years.

The blueprint – which illustrates that Beijing hopes to do more than play catch-up with U.S. outfits like Elon Musk's Neuralink, and Synchron – is unusually aggressive by global standards. Jointly authored by seven ministries, it integrates industrial planning, medical regulation, and research oversight into a single, coordinated playbook. The goal is to push BCIs beyond the lab and into clinical use by 2027, with full-fledged domestic champions in place by 2030. ■

Intel, Shutterstock, AntGamer

ChatGPT users revolt over GPT-5 release

OpenAI battles claims that the new model's accuracy and abilities fall short.

ABOVE GPT-5 has a greater context size, more recent data, and a greater output size, but CEO Sam Altman has been struggling to sell the new model.

OpenAI made a controversial move in August by replacing all of its older GPT-4 models with a single GPT-5 model, which it claimed was more accurate, more capable, and faster than ever before.

Although some users have highlighted its impressive response times and ability to pass certain technical tests, users have revolted, claiming it's lost some creative spark, frequently provides inadequate responses, deliberately avoids emotional and sensitive topics, and performs significantly worse than its predecessors.

It's been such a backlash that OpenAI quickly re-added the previous flagship 4o model, though only for paying subscribers. It has also introduced an "auto," "thinking," "fast," and "pro" mode for users of the new model.

OpenAI launched GPT-5 with high hopes, describing it as the "best AI system yet," capable of "smart, efficient" reasoning and responses. OpenAI claims that the model listens to user intent and adjusts its responses accordingly, with a built-in "router" that could look for errors and make it more refined, with mini versions of the model taking over if usage limits are ever too high.

> "The OpenAI CEO hinted that the company was approaching the Artificial General Intelligence (AGI) landmark, which many companies claim is the holy grail of AI development."

It was supposed to be better for coding, better for business, better for creativity, but the user response suggests it's anything but. A quick glance at the ChatGPT subreddit shows that it's filled with complaints about how poor GPT-5's responses are. Some highlight its limited emotional range, responding to the news of the death of a loved one with recommendations for funeral homes. In comparison, GPT-4 variants were almost overly emotional and verbose, which is perhaps something OpenAI had hoped to clear up with this new model.

Some of GPT-5's errors, which have been widely shared online, make the model look poor. This highlights that even if it makes errors in certain tasks less frequently, GPT-5 is still very capable of falling on its face.

That makes Altman's boundless enthusiasm for this release all the more surprising. The OpenAI CEO hinted that the company was approaching the Artificial General Intelligence (AGI) landmark, which many companies claim is the holy grail of AI development.

GPT-5 doesn't appear anywhere near that, and is arguably less impressive than its predecessors, since it should be more capable. The release of GPT-5 is now raising questions about whether AI development is plateauing.

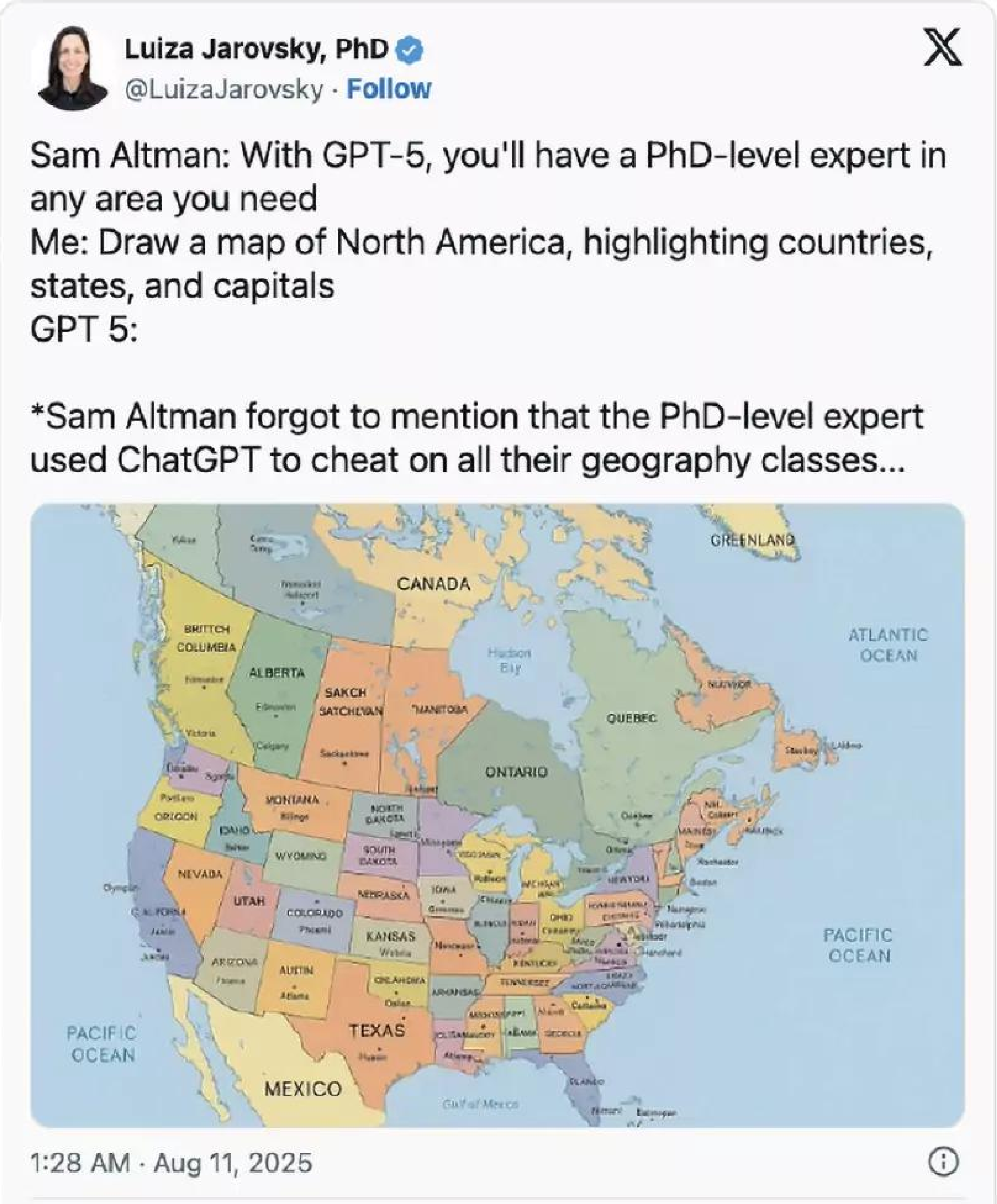
But OpenAI is not about to admit any major fault just yet. It has expanded options for GPT-5 and increased messaging limits for the more capable "Thinking" version. OpenAI is also said to be working on a new, warmer version of GPT-5, but without dipping into the sycophantic behaviour that characterised GPT-4o at times.

It's also reinstating older models, making the drive for a singular GPT-5 feel a bit redundant, even if it is likely to please fans who have a specific attachment to the flavour of an older model.

Despite the launch of GPT-5, OpenAI has an uphill battle to fight in the weeks and months ahead. Despite managing to top the charts of several AI benchmarks, something isn't landing well with users. With updated models from big-hitters like Anthropic, Meta, and more surely on the horizon, OpenAI may be vulnerable to a loss of market share in the competitive AI thunderdome.

ChatGPT may be a household name for now, but if it can't keep public sentiment on its side, competitors could edge out the supposedly leading GPT-5 model. **Jon Martindale** ■

BELOW Despite impressive performance overall, GPT-5 still makes embarrassing mistakes.



Sam Altman: With GPT-5, you'll have a PhD-level expert in any area you need
Me: Draw a map of North America, highlighting countries, states, and capitals
GPT 5:

*Sam Altman forgot to mention that the PhD-level expert used ChatGPT to cheat on all their geography classes...

© Getty

How AMD builds entire chip families from just four dies

Multiple models without new silicon.

Graphics processing units (GPUs) are designed in a way that their performance can be scaled up or down during the design phase, or even after tape-out. AMD's 9000-series, built on RDNA 4 (also known as Navi 4), is no exception. AMD confirmed this during one of its Hot Chips 2025 presentations, and demonstrated how it can cut down the design of its GPUs to produce more SKUs.

All GPUs contain a massive number of similar components, including Arithmetic Logic Units (ALUs), caches, special-purpose hardware units, controllers, and physical layers (PHYs). So, if a defect occurs during production, the faulty part could be disabled, and the processor may still function correctly. However, it does not mean total flexibility. Some units reuse transistors between them, and others rely on data paths that are integral to neighbouring components. AMD claims it has designed RDNA 4 to be more adaptable than its predecessors, thanks to a feature it calls asymmetric harvesting.

By selectively disabling components, adjustments can be made to memory systems and asymmetric resource allocation. This allows the company to produce higher-end, mid-tier, and specialised GPUs from the same base design, or even the same die.

By using this strategy, AMD spawned a smaller Navi 44 (Radeon RX 9060-series) out of the bigger Navi 48 (Radeon RX 9070-series) design by reducing the number of shader engines (SEs), Infinity cache, GDDR6 controllers, and PHYs, but leaving things like the command processor, display engines, media engines, security processor, and other specific things intact. By reusing photomasks from Navi 48, AMD saved on manufacturing costs. In addition to this, AMD built the Radeon RX 9070 and RX 9070 GRE from the full-fat Radeon RX 9070 XT by disabling certain elements, which essentially increased yields and enabled them to hit pricing targets. Such an approach also shortened the relevant GPU's time-to-market, as fewer unique silicon designs required tape out, validation, and production.

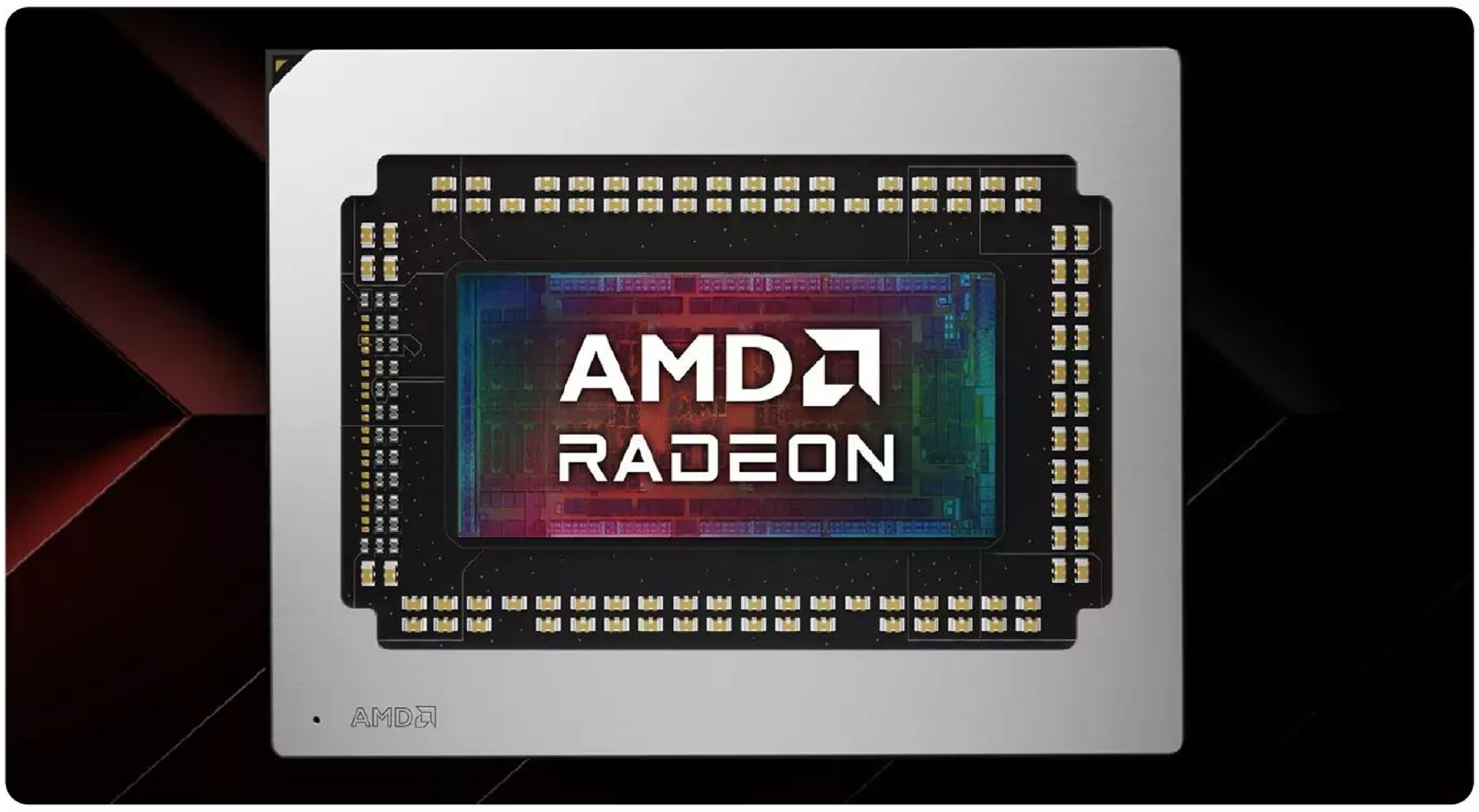
The commercial implications of AMD's asymmetric harvesting approach are significant: so far, the company has built a line-up of seven products for desktop PCs and inference servers using just two processors: the Navi 48 and the Navi 44. In theory, AMD could add four or more RDNA 4 GPUs for notebooks to its line-up, if it were interested in competing in that market.

Unfortunately, AMD decided not to pursue the high-end desktop GPU market with its RDNA 4 architecture. If it had developed a high-end RDNA 4-based GPU (by beefing up the command front end and L2 caches and attaching four more SEs, as well as two more memory interfaces), it would have been able to add at least three more products to the line-up and address a lucrative market, which it has seemingly left exclusively to Nvidia.

Nonetheless, asymmetric harvesting assists AMD on both the manufacturing and marketing fronts. By embedding harvesting at multiple levels – from shader engines and work group processors to compute ratios, and memory channels – AMD maximises output from each wafer, builds products according to market needs, and sustains a consistent feature set across product lines. This makes AMD's GPUs slightly more lucrative for the company, as it helps keep costs manageable, since it increases the number of dies that can be sold.

Anton Shilov ■

> "AMD claims it has designed RDNA 4 to be more adaptable than its predecessors, thanks to a feature it calls asymmetric harvesting."



© AMD

AMD's AM4 platform is going out with a fizzle

Having saved AMD from the brink of bankruptcy, Mark Williams applauds AM4 as it rides into the sunset.

The AM4 platform, which underpinned AMD's success with its Ryzen-based CPUs, is one of the pillars of AMD's strategy in making its platform more desirable than Intel's. It offered a consistent long-lived platform which consumers can rely on being able to upgrade for many years later. It's worked so well, in fact, that since its introduction in 2016 there have been CPUs released for AM4 every single year, right up to and including 2025. That's a whopping nine years of support! From pre-Ryzen era Athlon X4 CPUs right through to this year's release of the Ryzen 5 5500X3D, it's had an amazing lifespan and continues to this day as the best option for those on a budget.

All good things must come to an end, however, and it's beginning to look like the best days of AM4 are now behind us, with the future looking like it's about to get worse.

While the cream of the CPU crop on the AM4 platform for gaming is the Ryzen 7 5800X3D, it has a sibling CPU that worked just as well in the Ryzen 7 5700X3D, offering essentially the same performance at a slightly lower price. However, in August of 2025 AMD has now also ended the 5700X3D, leaving no new X3D parts available for AM4 customers. There was a 5600X3D exclusive for North America, but that also ceased last year. As already mentioned, the only remaining X3D part being offered currently is the 5500X3D, but that's only sold in the South American region. Effectively, if you wanted to maximise your AM4 PC for gaming, and haven't already got an X3D CPU, you're now out of luck and dependant on the second-hand market.

While X3D parts have all but dried up, AM4 still remains popular in budget systems and as such still needs DD4 RAM to build them out. Recently though, Micron announced it would be ending DDR4 production in a few months, joining Samsung, SK Hynix and China's CXMT in ceasing production for the still in demand memory. The spot price for DDR4 spiked as a result and panic buying ensued. With US tariffs certain to also hit the segment, it's expected further panic buying will ensue from the US, creating more demand for DDR4. This has created a bizarre situation where for the first time in history the old outgoing RAM is going to become more expensive than the newer one!

Taiwanese company Nanya is sticking by its DDR4 production for now though and is expected to raise prices with demand as it takes up whatever slack in the market it can bear. Once it's the last man standing though, don't expect things to get any better.

If you have an AM4 system and have been thinking about upgrading your RAM – or just want to future proof it for a bit longer – do it now while there's still some decently priced stock floating around, as in a few months' time it won't be financially beneficial anymore, if it's even possible.

Lastly, there are reports that stock of low-end motherboards also drying up. Although seemingly just hearsay, the undeniable trend is that AM4 at retail is on its last legs, and if you're using it, upgrade anything you can now while you still can. ■

Mark Williams is an IT professional with a strong interest in voiding warranties.

NEW IN apc

Intel is once again being thrown a lifeline — how did we get here?

A rocky recent history has Intel fighting for its life.

It's been hard to watch as Intel has slowly morphed over the last 20 years, from ubiquitous 'Intel Inside' stickers establishing the brand in public consciousness, to the modern day, where on the whole, AMD chips are increasingly popular and better value.

Years of mismanagement and poor judgement have put Intel on the wrong foot. Despite grants from the 2024 Chips and Science act (CHIPS Act) to bolster semiconductor making in the US, Intel is still in a precarious position. The US has also taken a US$10B stake in the company (accounting for 10% of its shares) while Japan's Softbank has invested US$2B. Things may turn around for the company, but it's been a long road to get here.

Intel rode the microprocessing wave into the 2000s with an incredible market presence. It had close ties to Microsoft and the development of the PC space, and even Apple adopted the Core Solo chip with the Mac Mini in 2006. It had famous wins like the groundbreaking P5 Pentium and others – but its failures are much more widely known.

PC fanatics are probably most familiar with the advent of cost-effective AMD Zen chips bringing a hatchet to Intel in 2017 – I remember this well, having purchased a Ryzen 5 1600 that year. Since then, AMD systems have become much more widespread and are often recommended over Intel. Though the recent Steam hardware survey still indicates a 58.74% Intel dominance among users, that figure has dropped nearly 10 points in only a year.

Lesser known, and also since 2017, Intel has lost out when it comes to server share. Though the company still commands just under two thirds of the market with its Xeon chip, AMD and Arm have made things more difficult for Chipzilla.

Intel took one of its most famous tumbles when Apple made the big shift to its own in-house silicon with the M1 SoC. Intel might have bounced back briefly after reporting COVID-era earnings in April 2021, along with an AI push in late 2023, but it's failed to make lasting changes to keep its success up.

That decision by Apple has roots in the original iPhone in 2007 – which Intel refused to supply chips for. The company has since been treading water in the booming SoC market, and in 2014, cancelled its Atom line of smartphone processors.

The company also has its modern blunders. Intel dodged the external GPU market for years, to the point that it's now playing catchup to Nvidia and AMD with the unpopular Arc range. Meanwhile, Intel has quality control issues to account for with the 13th and 14th generation of CPUs, while reports have indicated that Intel will shift to an entirely new architecture with its next-gen, causing headaches for upgraders. The company also announced layoffs in April 2025.

Here's a fun fact from a book I recommend to you called *Apple In China* by Patrick McGee – By 2015, Apple investments in Chinese businesses reached US$55B per year. Understanding that Intel needs to worry less about the same manufacturing volume as Apple, though still acknowledging the high costs of chip manufacture, I'm still left wondering by that insurmountable amount of money – has Intel really been given enough money to save its skin?

■ **Zachariah Kelly**

Zac's been pulling computers apart since he was 12, and focuses on peripherals and monitors for APC. Zac also writes for TechRadar.

A game made by three Adelaide developers has changed the industry

Hollow Knight Silksong was one of the most anticipated sequels in recent memory, and also the most impactful.

Last month some quarters of the videogame industry were in shambles. It wasn't due to mass lay-offs at major studios – though they assuredly happened – nor did Bobby Kotick, Phil Spencer or Shawn Layden say anything controversial enough to foment impassioned discourse. No, nothing like that: the industry fell into tumult because an adventure platforming game made by a tiny Adelaide team was released after eight years in development.

Hollow Knight Silksong follows the huge success of the 2017 original, which had its origins as a Kickstarter-funded project. In an industry increasingly accustomed to unlikely success stories, the meteoric rise of *Hollow Knight* still seems puzzling on paper. It's a dark, uncompromisingly difficult sidescrolling adventure that demands a lot of the player in terms of patience, dexterity and curiosity. In 2017, if you had asked any executive if *Hollow Knight* would give rise to what, in 2025, feels like the most anticipated game of the decade so far – and we're talking Bethesda and Rockstar levels of anticipation here – they would have laughed. And frankly, I wouldn't have blamed them.

On paper it's puzzling, but in practice, it doesn't take long to figure out what *Hollow Knight* has that many others don't, even though that "thing" can only be expressed in abstractions and not cold numbers and charts. Namely, it has utmost confidence in its own bizarre vision. It doesn't really "innovate" or anything like that, it's just very clearly the product of artists who understand the tradition they're working in and thus, know how to bend it to their own artistic ends. This game is not made for a mass market or even especially for a niche one. Unlike the majority of major blockbusters (not to mention swathes of indie games) it feels like the product of human artists and not a figure-centric hivemind. Make no mistake: there are droves of other games also developed with seemingly the same spirit that have not found much success at all. But *Hollow Knight* did.

The level of obsession surrounding this sequel has kept online communities in a froth for years. So much so that when studio Team Cherry announced a September 4 release date, droves of other indie games got the heck out of the way, delaying sometimes as far out as November. Ysbryd Games, the publisher of forthcoming tactics RPG *Demonschool*, told *PC Gamer* that being drowned out by a huge game like *Silksong* "can be fatal in this saturated market, where every game has to fight and use whatever edge they've got available to stay visible."

Hollow Knight's confounding success should be a lesson to major western studios and publishers, but if they've been paying attention they're slow to execute on their learnings. Games do not need to cost hundreds of millions of dollars to develop, nor should they always look like a marketing executive's interpretation of the MCU. Team Cherry is another example of the industry's not-unpainful shift away from the old retail-oriented model into something that, in all honesty, is yet to properly materialise on the horizon. But if *Hollow Knight*, and *Peak*, and *Among Us*, and *Phasmophobia* (the list goes on) demonstrate anything, it's that imaginary concepts go much further than triple A bombast in 2025. ■

Shaun Prescott is an Australian editor for PC Gamer and GamesRadar, and writes for APC, TechRadar and more.

Connect more

Jon Honeyball wants to make you Wi-Fi Aware as a new standard comes into town.

There is a potentially fun and funky new Wi-Fi protocol that will become available with your mobile devices soon. Called Wi-Fi Aware, it's an enhancement of the existing and largely ignored Wi-Fi Direct peer-to-peer protocol. And I'm genuinely excited.

Available on Android and Apple devices alike, Wi-Fi Aware allows one device to find another device and make a direct connection between the two. No base station or router is required, no need for a wider internet connection. A device can publish a list of protocols and interfaces that it supports, and then a new client device can discover them and attach on as appropriate. This is usually to be done at the application layer, allowing for an app to discover other instances of itself.

The idea is that you can have a high bandwidth connection in the near-field, and with very low latency. It's possible to have multiple connections to multiple devices at the same time, so it isn't only a device A to device B connection. This means your phone could connect to a number of devices at the same time, and this doesn't interfere with normal Wi-Fi infrastructure operation.

Best of all, it's a peer-to-peer topology, which means that devices as peers can join and leave without upsetting the connections of others.

So, why am I excited? First, I can see a whole host of possibilities for this new technology. A camera app could join multiple devices together for a spatially distanced multi-shot recording. Or how about your phone automatically discovering other devices on your home network without relying on the main Wi-Fi or internet feed?

I can also see it solving the mundane annoyances that plague our lives, like those awful portal logins we have to jump through when using an electronic menu at a fast food restaurant. And you can take the traffic off the internet connection as everything just runs locally.

I can see NANs working well for in-car use too. One family can easily share information around or join the in-car entertainment systems. Maybe even stream material to the screens on the rear of the front seats.

Assuming the range is good enough, it would be an interesting technology for vehicle-to-vehicle connections too. I like riding my motorbike with friends, and Bluetooth headset voice comms falls into the "just about adequate" column. Have a higher data rate and I could inflict my music choice on everyone else. Joy!

But this does move us into the realm of management. If I have an app that can reach out to other instances of itself on local devices, I need to be certain that the data being shared is acceptable to me. I must be the one to authorise the flow to the other devices. Given how badly most operating systems manage this sort of data handling, it's going to be fascinating to see how well such peer-to-peer systems can be policed effectively by the user. Let's not even mention the possibility for malware and data theft.

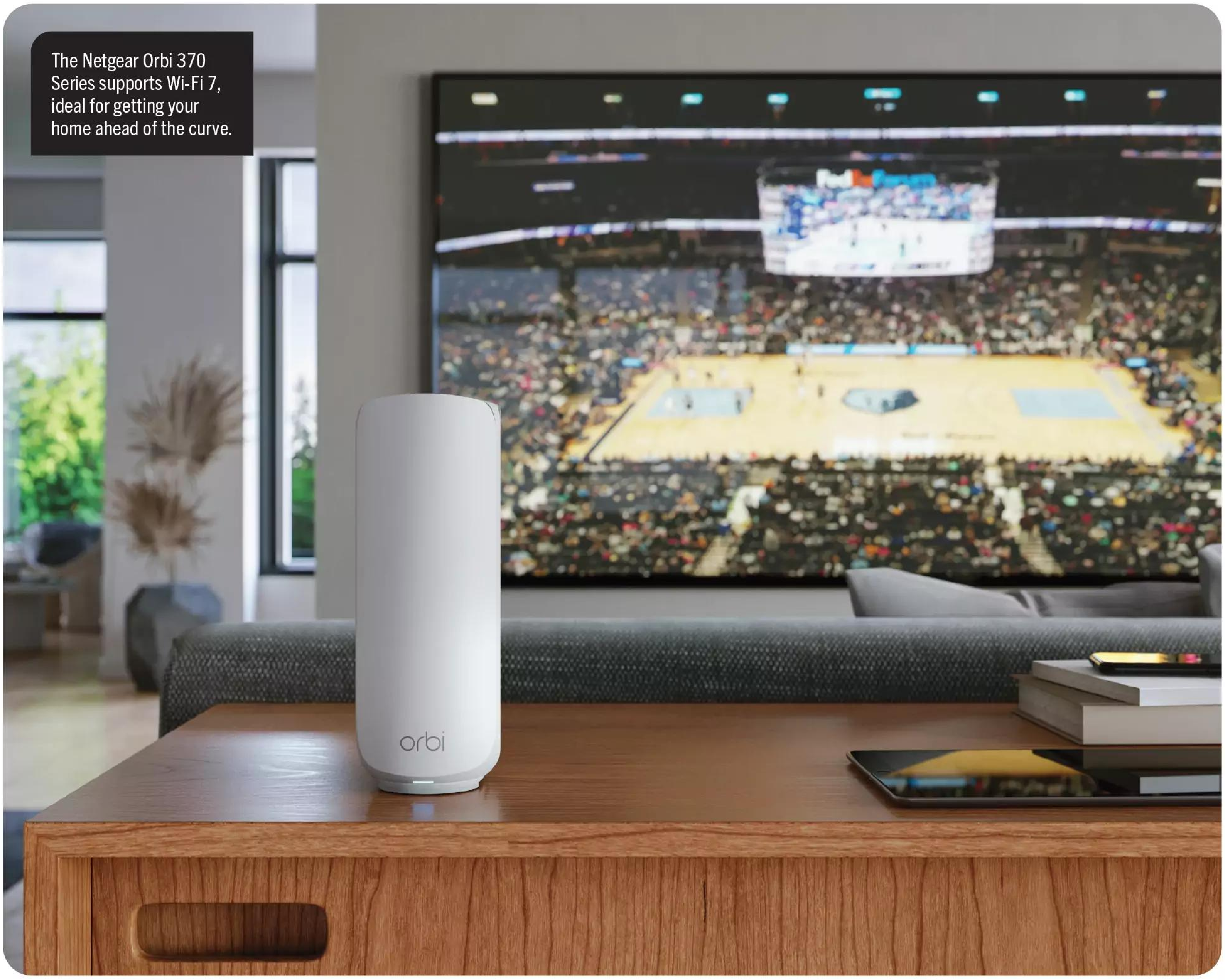
The potential use cases for Wi-Fi Aware/NAN are almost limitless – and I can't wait to see how supermarkets use it to bombard me with special offers as I wander past the fresh fruit. ■

> "If I have an app that can reach out to other instances of itself on local devices, I need to be certain that the data being shared is acceptable to me."

Jon Honeyball's favourite type of peer-to-peer networking involves a large gin and tonic.

GADGETS

Nice things to have


The Netgear Orbi 370 Series supports Wi-Fi 7, ideal for getting your home ahead of the curve.

Netgear Orbi 370 Series

With an ever-increasing number of devices appreaing that support the fast Wi-Fi 7 standard, the future is bright for the wireless tech. Initially pricey, we're seeing more appealing budget Wi-Fi 7 options appearing.

All of which makes the arrival of Netgear's new Orbi 370 Series timely. Not only does this mesh Wi-Fi system have Wi-Fi 7 baked in, it's also expected to be pretty affordable, with a 2-pack – comprising a mesh router and a satellite – available for just $240 in the US. Australian pricing hasn't been announced as we write this.

The result is faster Wi-Fi for everyone across your entire home with fewer dead spots and dropouts to spoil your enjoyment of video streams, gaming, surfing the web and more.

Like other Orbi mesh systems, the Orbi 370 Series is easy to set up via the Orbi app, and is backwards-compatible with non-Wi-Fi 7 gear too.

$TBA From netgear.com

This Wi-Fi system is affordable with a router and satellite or router and two satellites.

orbi
orbi
orbi

SHOKZ OPENDOTS ONE

Weighing just 6.5g each, you'll forget you're wearing the feather-weight OpenDots ONE. The clever nickel-titanium and soft silicone clasp hugs the back edges of your ears for a secure, slip-free fit. Your personal soundtrack comes through DirectPitch bone conduction, OpenBass 2.0, and a dual-driver setup, which deliver full, warm, and detailed tones. For non in-ear 'buds, the sound is unexpectedly rich and genuinely impressive. The compact charging case slips easily into your pocket and supports wireless charging, making it simple to power up whenever you need a boost on the go.

$339 from shokz.com.au

CAMBRIDGE AUDIO MELOMANIA P100 SE

Expect great sounds to go with this special edition version of Cambridge Audio's over-ear headphones. So what's the deal? Well not only are they available in a stylish shade of blue, but they also boast even better sound quality than the standard P100, thanks to Cambridge Audio's DynamEQ proprietary sound tech, premium quality 40mm drivers and Class AB amplification. The P100 SE also comes with active noise cancelling (ANC) and offers up to 100 hours of battery life (with ANC off) or 60 hours (with ANC on).

$529 From cambridgeaudio.com

ELGATO FACECAM 4K

Looking your best in virtual meet-ups via FaceTime or Zoom just got easier. Elgato's latest webcam enables you to live-capture your alluring visage in glorious 4K, thanks to its combination of 'pro' grade components and some tech trickery. These include a Prime Lens with a 90-degree viewing angle and a sharpness range of up to 1.2m, a 1/18in Sony STARVIS 2 image sensor and a state-of-the-art processor that reduces image noise and other artefacts. And just like on a DSLR camera, you can even set the ISO and shutter speed manually. Heck, it even does HDR. Smile!

$499 From elgato.com

MOUS CHARGING STATION WITH MAGSAFE

Available in Matte Black, Walnut and Aramid Fibre finishes, this is a great little wireless charger to have on your desk or nightstand. The Mous Charging Station can recharge up to three devices at a time – two via its MagSafe/Qi2 wireless charging pads and a third via its 18W USB-C port. You can also team it with Mous' Elevated Apple Watch Charger (available separately for $83) and power your Watch up too. The Charging Station's base is made from durable aluminium alloy with a 35% recycled polycarbonate/ABS top.

$172 From amazon.com.au

Subscribe & save over 40%

The best value way to get *APC*

SCAN ME

Simply scan the QR code above with your smartphone camera

ULTIMATE WINDOWS 11 UPGRADE CHECKLIST
#550 OCT 2025
apc
YOUR EXPERT GUIDE TO TODAY'S TECH
SINCE 1980
19 PRO-QUALITY MONITORS MEGATEST
• BEST VALUE • BEST QUALITY • BEST FOR YOU
ENHANCE YOUR PHOTOS & VIDEOS WITH AI
BEST FREE & CHEAP OPTIONS FOR PRO RESULTS
WINDOWS 11
All your questions answered
CAN YOU STILL USE WINDOWS 10 SAFELY?
CAN YOU CLAIM AN EXTRA YEAR'S SUPPORT?
HOW DO YOU UPGRADE OLD WINDOWS 10 PCs?
... & MANY MORE!
NEW!
EXPANDED HOW-TO SECTION
TUNE-UP YOUR TECH
COOL RUNNING
HOW TO STOP YOUR CPU FROM OVERHEATING
LG's DREAMY 5K OLED
WE RECKON THIS IS THE BEST MONITOR IN THE WORLD!
PAGE 30
FUTURE

At just **$7.04 per issue** for a 24-issue subscription, you'll save a huge 41% off the regular price – and with all the convenience of home delivery!

Lock in the low price and guarantee yourself 24 issues of Australia's greatest tech mag for just $169.

Print or digital? It's your choice!

Enjoy the traditional print edition, or if you prefer we offer digital magazines for both Android and Apple, and they're just $4.99 per issue!

ULTIMATE WINDOWS 11 UPGRADE CHECKLIST
apc
WINDOWS 11
All your questions answered
CAN YOU STILL USE WINDOWS 10 SAFELY?
CAN YOU CLAIM AN EXTRA YEAR'S SUPPORT?
HOW DO YOU UPGRADE OLD WINDOWS 10 PCs?
... & MANY MORE!
ENHANCE YOUR PHOTOS & VIDEOS WITH AI
EXPANDED HOW-TO SECTION
COOL RUNNING
LG's DREAMY 5K OLED

APPLE OFFER
Free 30 day *APC* app subscription trial.
Read our latest issue free today

ON iOS & ANDROID!

The Apple edition for iPhone, iPad and iPod touch
tinyurl.com/APCAPPLESTORE
From $4.99 an issue

The Zinio edition for all Android devices
apcmag.com
From $4.99 an issue

Subscribing is quick and easy

SCAN the QR code and follow the prompts, **VISIT** www.techmags.com.au **or CALL** (02) 8227 6486

SCAN ME

TERMS & CONDITIONS: This offer expires October 10th 2025, and is available to subscribers within Australia only. Please allow 6-8 weeks for delivery of your first issue. For full terms and conditions, see: http://techmags.com.au/style/images/FutureTC.pdf Please see our privacy policy on page 3. *Six issues for $59, then $59 charged to your credit or debit card every six issues thereafter on auto-renewal.playback; 32x22x1.7cm; 1.78kg.

The new RX 9000-based Asus TUF Gaming Radeon cards are built with high performance cooling for reliability and sustained performance.

There are several Asus Radeon RX 9060 and 9070 variants on offer to meet every need and budget.

ASUS' NEW TUF GAMING AMD RADEON GRAPHICS CARDS ARE TURNING HEADS

MEET THE UNCOMPROMISING CARDS THAT OFFER STABILITY, RELIABILITY, PERFORMANCE AND VALUE.

The new generation of graphics cards is upon us and the improvements to Asus' TUF Gaming Radeon range represent far more than a minor evolution: there are transformational benefits. Based upon AMD's new RDNA4 architecture, the new Asus TUF Gaming cards afford the ability to reliably play the latest and greatest games at 4K resolutions and beyond!

To mark the launch, Asus has teamed up with *APC* to tell you why you should consider an AMD Radeon-powered TUF Gaming card for your next upgrade. Here's what you need to know...

WELCOME TO AMD'S RDNA4 ARCHITECTURE

RDNA4 arrives with a new, more-efficient and more-performant 4nm manufacturing process, RDNA4 computing units, 3rd generation ray-tracing accelerator and a raft of AI-enhanced HYPR-RX technologies which brings a huge generation leap in performance of up to 46% of raw performance between generations, while boosting your gaming immersiveness.

Upgraded AMD Fluid Motion Frames (AFMF 2.1) uses AI to generate additional frames (in thousands of games), taking the load off the GPU and seamlessly improving framerates by a factor of up to 3x!

AMD Radeon Super Resolution (RSR) technology upscales games to run at both higher resolutions (including UHD) and higher framerates with a negligible drop in quality. FidelityFX Super Resolution (FSR) levels this up by using machine learning to simultaneously improve performance while enhancing visuals: ray-tracing alone is improved by 2x over the previous generation! FSR does this by dynamically learning how light propagates throughout a scene to predict light-paths more efficiently. It infers scene-wide lighting paths from small objects (shifting significant work from the GPU), and reconstructs high-quality visuals from low-resolution frames.

When things get fast-and-frantic, Radeon Boost dynamically adjusts the resolution (in DX11 titles) and/or shading rates (in DX12 titles) to improve responsiveness. Meanwhile, for a growing library of games, AMD Radeon Anti-Lag 2 facilitates faster click-to-response times, reduced input-lag and lower latencies for snappier gaming action.

You can adjust HYPR-RX settings and select HYPR-RX Profiles from the home tab in the AMD application. Options include HYPR-RX Eco Mode (which automatically delivers smoother, more-power-efficient gameplay), and Radeon Chill which saves power by dynamically capping framerates according to onscreen motion intensity. Other RDNA4 advances include moving PCI Express 5.0 (for faster data transfer) plus HDMI 2.1b and DisplayPort 2.1a.

So, how does all this look on Asus' new TUF Gaming Radeon cards?

WHY ASUS TUF?

Asus' TUF range of graphics cards hits the sweet spot of performance, stability, features, design and value that many buyers demand. They combine high-quality components with robust and innovative construction processes to ensure they're tough and reliable.

ADVERTORIAL

AMD RYZEN RADEON

Stainless Steel 304
HDMI
DP
DP
HDMI
Stainless Steel 304

Asus meets your connectivity needs with the new cards offering a choice of ports to connect to your monitor or TV.

> **"ASUS' TUF RANGE OF GRAPHICS CARDS HITS THE SWEET SPOT OF PERFORMANCE, STABILITY, FEATURES, DESIGN AND VALUE THAT MANY BUYERS DEMAND."**

TUF GAMING
TUF GAMING

At their heart lies Asus' Auto-Extreme manufacturing process, which uses single-pass soldering, fewer chemicals and less power to minimise production defects and environmental impact. 5K black metallic capacitors (these have a 52% wider temperature tolerance than standard capacitors) are used, along with Military-grade chokes and MOSFETs, to deliver undeviating power to the GPU for enhanced system stability. Meanwhile, the circuit board (PCB) has a special coating to protect against short circuits from moisture, dust and debris.

Next to the GPU, there's a phase-change thermal pad that melts to fill gaps between the chip and cooler. This significantly improves thermal conductivity, heat dissipation and longevity. It operates in tandem with Asus' MaxContact manufacturing process which expands the surface area of the GPU's heat spreader by 5% and helps drop temperatures by 2°C!

The new TUF Gaming cards also use multidirectional Axial-Tech fans which reduce air turbulence and noise, while offering up to 31% more displacement than regular fans. Their dual-ball bearings ensure quieter operation and double the lifespan to 80,000 hours, and when GPU temps fall below 55°C, they stop by default for silent running!

Cooling efficiency and stability (and physical strength) are further augmented by the Vented Shroud (which has a diecast casing and aluminium backplate to increase heat dissipation and prevent PCB flexing) and by Asus' GPU Guard and Bracket which ensures uniform pressure from the cooling hardware across the GPU – reducing the risk of cracks.

As if this attention to detail wasn't enough, the cards also undergo torture testing to ensure reliable operation when experiencing extreme vibrations, temperatures, humidity and even 'salt fog' corrosion incidents.

Other TUF Gaming features include a Dual-BIOS switch to toggle between Quiet and Performance modes; GPU Tweak III overclocking software; and – for video editors – a month's subscription to Adobe Creative Cloud worth $113!

In short, Asus TUF graphics cards won't let you down.

MEET THE NEW ASUS TUF GAMING RADEON GRAPHICS CARDS

Asus' TUF Gaming graphics cards cater to all performance needs and budgets. The arrival of the new generation is heralded by several new models which utilise all the above features. Let's look at two that may be perfect for you.

ASUS RADEON RX 9070 XT TUF GAMING OC 16GB GDDR6

This beastly 3.125-slot card has one HDMI port and three DisplayPorts. It requires three eight-pin power connectors, and an 850-Watt PSU is recommended. It comes with a generous 16GB of GDDR6 vRAM which operates along a 256-bit bus. It has 64 compute units, 64 ray accelerators, 128 AI accelerators and 4,096 stream processors.

The default Game Clock speed is boosted from 2,400MHz to 2,520MHz and is pushed to 2,540MHz in OC Mode. The default Boost Clock is upped from 2,970MHz to 3,060MHz and reaches 3,080MHz in OC Mode.

ASUS RADEON RX 9060 XT TUF GAMING OC 16GB GDDR6

This high-value monster retains three-cooling fans but takes up just 2.5 slots. It has one HDMI port and two DisplayPorts and can operate with a lesser, 550-Watt power supply using just one eight-pin power connector.

It too comes with 16GB of GDDR6 vRAM which operates along a 128-bit bus. It has 32 compute units, 32 ray accelerators, 64 AI accelerators and 2,048 stream processors.

Game clock speed is boosted from 2,530MHz to 2,780MHz by default (2,800MHz in OC Mode). Boost clock is upped from 3,130MHz to 3,320MHz (3,340MHz OC Mode).

This more-wallet-friendly option can still run games at 4K and beyond.

RADEON
TUF GAMING

These cards look great and will compliment your gaming PC with style.

TUF GAMING
OC 16GB
AMD RADEON RX 9060 XT
TUF GAMING
OC 16GB
AMD RADEON RX 9070 XT

Whatever your gaming requirements, Asus' new TUF Gaming Radeon graphics cards have you covered. **Find out more at *tinyurl.com/AsusRadeonTUFGaming***

Batteries that eat carbon dioxide

Lithium-carbon dioxide batteries can store renewable energy while absorbing carbon. How do we move from theory to building, asks Nicole Kobie.

Carbon dioxide is a bit of a problem, what with changing the climate and all. But what if we had batteries that could not only trap this problematic gas, but also store renewable energy?

That is exactly what researchers at the University of Surrey are working to create: a lithium-carbon dioxide (Li-CO_2) battery. If successful, such batteries could not only help suck carbon dioxide out of the air but also offer better solutions to power electric vehicles, the energy grid and even missions to Mars.

But don't breathe a sigh of relief just yet: not only are these designs merely batteries in gas-filled jars in a lab, and at least a decade off in the future in terms of commercial viability, they also come with plenty of caveats. The question is, how do we get from here to smartphones that inhale CO_2 and exhale energy?

Building a better battery

Cars and laptops alike are powered by lithium-ion batteries, which move lithium ions back and forth to either power a device or recharge, using a lithium metal oxide such as lithium cobalt oxide as the cathode and a graphite as the anode.

While these work well enough to power gadgets around the world, this design comes with challenges, including costs, the use of conflict minerals, difficulty in recycling, and less charge capacity every time the battery is recharged. What's more, lithium-ion batteries have an annoying tendency to catch fire if damaged or overheated – you may remember Samsung having to recall the Galaxy Note 7 after it kept exploding back in 2016.

So this leaves us on the hunt for a better battery. In particular, researchers such as Daniel Commandeur, a Surrey Future Fellow at the University of Surrey; Siddharth Gadkari, lecturer at the same institution; and PhD student Mahsa Masoudi. The aim is to produce a battery that is cheaper, provides better performance and suffers from fewer environmental or ethical impacts. How nice if it's also less likely to explode. There are plenty of options, as we explore in "New batteries on the horizon" on p24.

Accidental improvement

A little over a decade ago, researchers in the United States and France were attempting to create a lithium-air battery; instead of moving ions, these batteries would be powered by a chemical reaction between lithium and oxygen.

Commandeur told *APC* that there has been a lot of interest in lithium-oxygen or lithium-air batteries, as well as zinc-air. "It's a misnomer," he said. "They're working with oxygen rather than air, and often actually for them to work well you need pure oxygen, rather than just drawing it in from the air."

Normally, he says, a battery would be made up of two solid electrodes inside a liquid, but this style of battery uses a solid electrode, liquid electrolyte (though sometimes solid state) and a gas inlet. "They poke all these holes in the batteries to allow the gases to flow in," Commandeur explained. "These are quite an unusual kind of battery. Metal

ABOVE Lithium-ion batteries can catch fire if damaged or overheated.

gas batteries are in their infancy – it's quite a weird thing to do."

However, alongside oxygen, our air naturally has carbon dioxide, and when mixed with lithium that creates lithium carbonate. In a battery, such contamination causes issues including electrical resistance.

"There was a theory that these batteries weren't working as well as they could because there was too much carbon dioxide in there, and these liquid parts of the batteries preferentially absorb carbon dioxide – they're better at absorbing it than oxygen," said Commandeur. "So even with a little bit of carbon dioxide in the atmosphere, they found it was spoiling their batteries, so people were starting to look into how much carbon dioxide is too much."

As a result, researchers sought to reduce or eliminate carbon dioxide in lithium-air battery experiments – until a team of French and American scientists noticed that this so-called contamination had benefits. "They found something quite exciting, which was you put in a bit more carbon dioxide and the capacity of the battery, how much charge it can store... shoots up by quite a lot," said Commandeur.

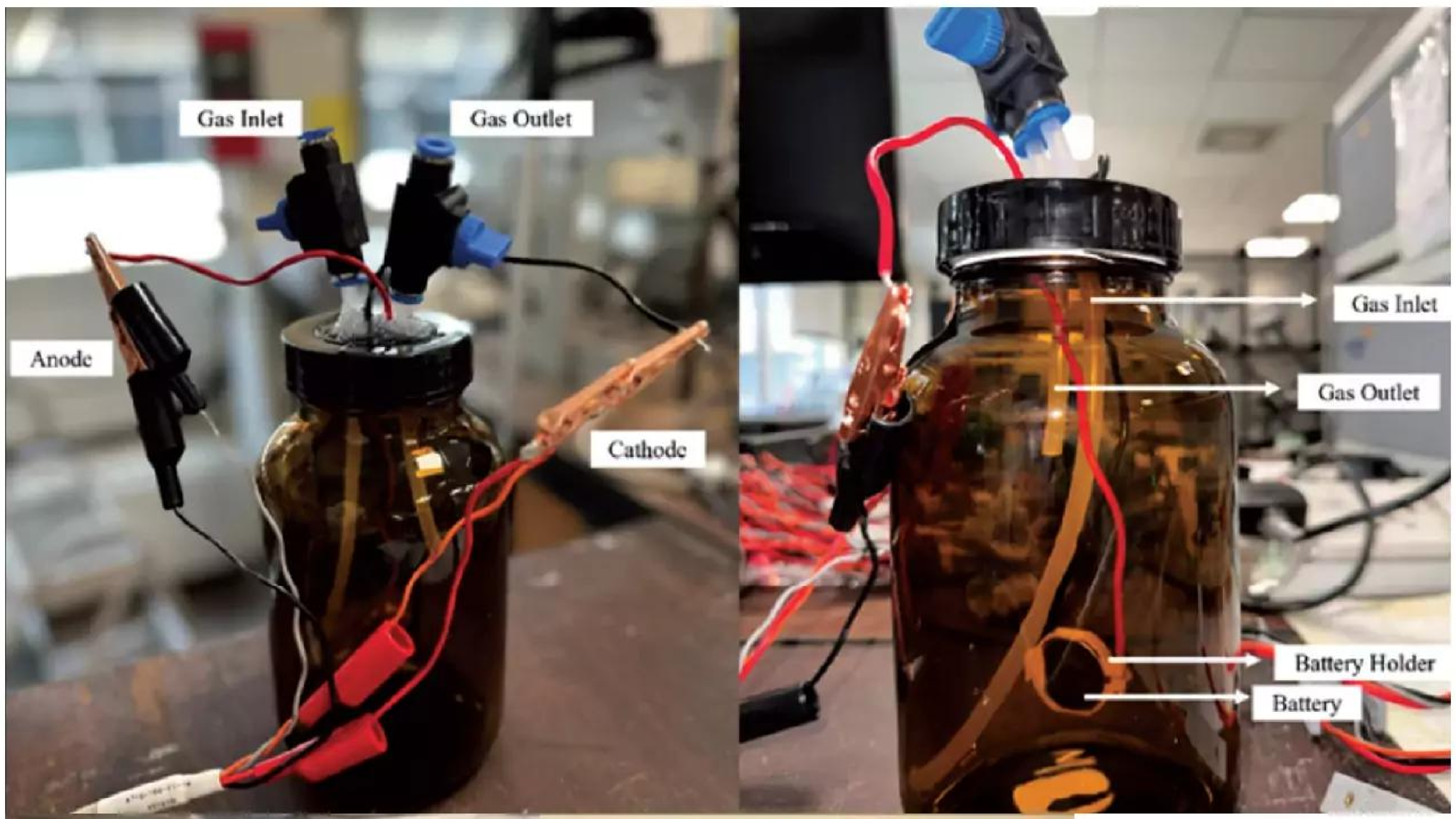
In a paper in 2012, the scientists noted that it actually improved the battery's charge. And that sparked a new line of research into creating lithium-carbon dioxide batteries, with the first demonstration of a proof-of-concept design in 2015 followed by a fully rechargeable version in 2019. Since then, efforts have continued to improve the design, boost the performance and make it commercially viable.

How it works

The lithium-carbon dioxide system works by creating a permeable battery that can allow carbon dioxide access to the liquid electrolyte, where it can react with dissolved lithium.

The reaction between lithium in the battery and carbon dioxide in the air forms lithium carbonate. "It's a four-electron process," said Commandeur. "In simple terms, that means that rather than changing over one electron per reaction, it changes over four – effectively, you're doing four times the amount of charge storage per chemical reaction."

In a standard lithium-ion battery, only one electron is exchanged per reaction. By exchanging four, this design could massively expand performance. Commandeur adds: "This is the reason why those batteries theoretically have a much higher energy density than normal."



ABOVE In the lab tests, batteries are placed in jars filled with carbon dioxide. **FAR LEFT** Researcher Daniel Commandeur believes batteries could soak up CO_2 **LEFT** Siddharth Gadkari is explorig better battery tech.

Existing lithium-ion batteries have an energy density of 250 or 300 watt-hours per kilogram, while the theoretical energy density for lithium-carbon dioxide is as much as 1,800Wh/kg. But, the researchers stress, that remains unproven. "Even though the theoretical energy density is quite high, even in lab scale studies people have not reached that; they are very much closer to lithium-ion or slightly higher," said Gadkari. "It will take a few years before it can actually reach that."

So far, the batteries have been tested under ideal lab conditions. "We take a jar, fill it with carbon dioxide, and put our battery in the jar," Commandeur explained. "Very rarely would you find circumstances with that amount of carbon dioxide.

"But what we want to look into now is what if we were to reduce the pressure of that carbon dioxide and make it a little bit more like realistic conditions," he added, perhaps more like the levels seen in a car exhaust or natural gas boiler – or even just in the levels seen in the regular atmosphere. "They're not going to work quite as well obviously as in ideal conditions," Commandeur said, possibly reducing the capacity of the battery.

There are more caveats, including seriously limited charging cycles. So far, researchers across the field have only managed 100 cycles with this style of design, well below the many thousands achieved by commercial batteries today. They believe that lithium-carbon batteries could be viable if they can last beyond 1,000 charges and prices can be cut by removing all scarce materials.

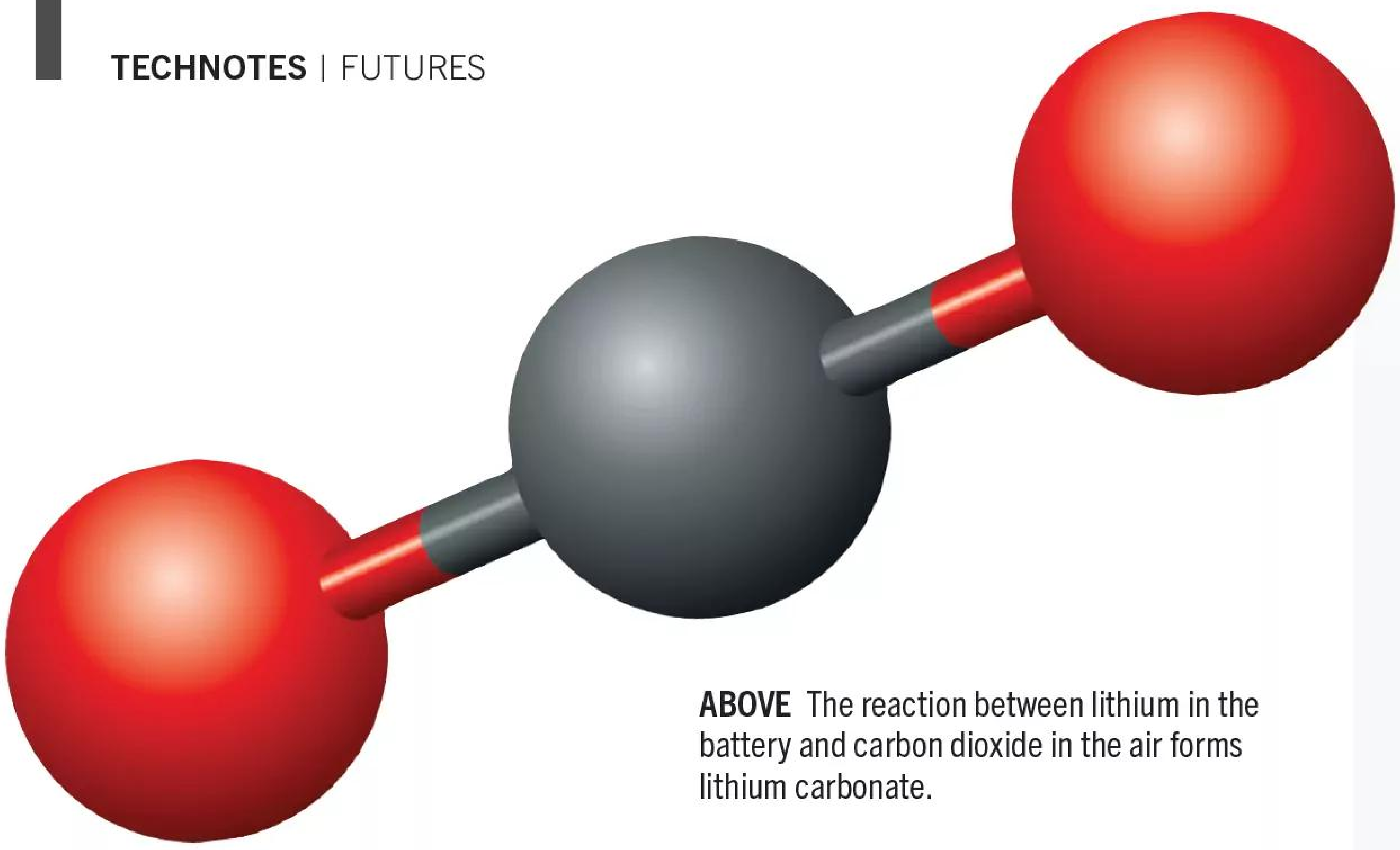
Alongside that, the researchers are developing a case that only lets in carbon dioxide. "It will be a lot more tricky than in a conventional battery, because we're dealing with the liquid-gas interface there," said Commandeur. "Inevitably, it will be about designing technology that allows the passage of carbon dioxide in while preventing the electrolyte from drying out – it's a big, big engineering challenge there."

Recharging challenges

There are other challenges, notably what happens during recharging. First, breaking down the lithium carbonate to recharge requires a boost of energy; that can be reduced using a catalyst, but they are expensive and often require rare metals.

In a recent paper, the Surrey team revealed success using an alternative catalyst to those expensive and rare metals: caesium phosphomolybdate, which they simply call CPM.

Not only is it cheaper, the CPM material kept the batteries stable for 107 recharge cycles – above the 100 or so previously



ABOVE The reaction between lithium in the battery and carbon dioxide in the air forms lithium carbonate.

achieved, but nowhere near the thousand required for commercial success – while storing two-and-a-half times as much charge as a comparable lithium-ion design. Next up is ditching the caesium in favour of an even cheaper alternative.

Welcome back, carbon dioxide

There's another problem raised by recharging these batteries: the process releases the carbon dioxide, meaning you're not permanently removing any from the atmosphere.

The battery uses carbon dioxide, mixing it with lithium to create lithium carbonate and energy. That process removes carbon dioxide from the atmosphere – but if you want to use the battery more than once, the recharging process uses electrical energy to decompose the lithium carbonate and carbon back into the original lithium and carbon dioxide. So, the carbon dioxide doesn't disappear.

"Basically, the battery will give out energy while drawing in carbon dioxide," Commandeur explained. "Then you have the option, if you want to recharge the battery, of releasing the carbon dioxide."

That means this isn't yet a solution to eat up emissions and output them into non-dangerous materials while powering homes, as wonderful as that would be. "It's not like 100% capture, because it's letting go of that captured carbon dioxide again in the charging/discharging process," said Gadkari.

That said, these batteries could be used alongside carbon capture systems to use all the carbon dioxide that's trapped and stored, as it would effectively be lab-like conditions in terms of gas purity. The lithium carbonate produced by the reaction is also a precursor material for making lithium-ion batteries. In other words, if you built the right system, you could use up carbon dioxide to store power and make more materials for more power.

"You can be quite imaginative with how these systems could be integrated," said Commandeur.

But all of that is a long way off; at least a decade, suggests Gadkari.

Why it's worth the work – and the wait

While the challenges are serious, this technology could be worth the wait. Though they're unlikely to ever be small enough to power your phone or laptop, one particularly good use could be balancing grids, such as storing renewable energy gathered at peak times to be used when the wind isn't blowing or the sun isn't shining. "The most important application is definitely grid-scale energy storage," Gadkari said. "Because of its high-energy density, it's attractive for large-scale grid storage, helping to stabilise our renewable energy storage."

These batteries could work with cars, not least because there's plenty of carbon dioxide available on road networks. "If we have a kilogram of catalyst in there, then we can basically absorb all of the carbon dioxide from a day's driving," said Commandeur.

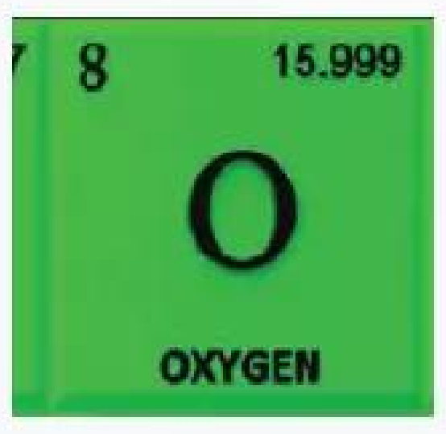
Gadkari has even bigger goals. "The fantasy application is the Martian atmosphere, because it's 95% carbon dioxide. And whenever there are any Mars shuttles or Mars programmes or any kind of settlements, they will need batteries," he said. "These batteries can easily work there."

A safer battery that could clean up our own atmosphere and power space travel? Not bad for jars in a lab. ■

New batteries on the horizon

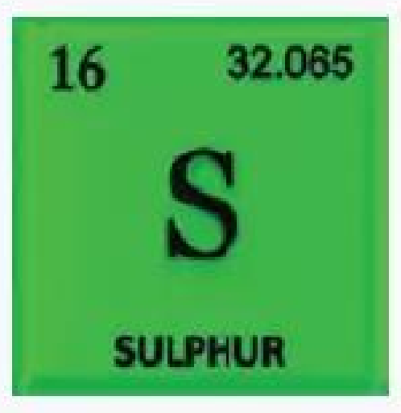
Lithium-ion batteries have plenty of benefits – good energy density, fast charging and light weight among others – but there are enough downsides that researchers have long been seeking alternatives. Lithium is costly to extract, requiring huge amounts of water, and the batteries remain difficult to recycle. Plus, if damaged they have a tendency to catch fire and even explode. Here are a few potential replacements that are already in the works.

Lithium-air/lithium-oxygen



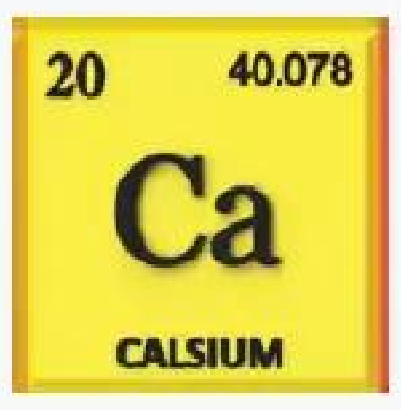
Like lithium-carbon dioxide, these batteries have a higher theoretical energy density than lithium-ion batteries. But they also face issues with degradation when recharging, complicated engineering, and the possibility of fires, especially if pure oxygen is used.

Lithium-sulphur



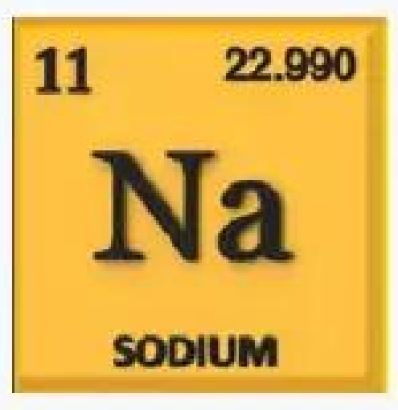
Proponents of a lithium-sulphur design claim it could deliver twice the energy density of lithium-ion designs while being much lighter. That makes them ideal for use cases where weight matters, so they've already been used in drones and satellites, and companies such as Lyten are working on versions for electric vehicles. In addition, sulphur is a cheap, easily accessible material.

Calcium-oxygen/air



This design has particular merit because calcium is widely available. A project based at a trio of universities in China has successfully created a rechargeable calcium-air battery that manages 700 recharge cycles using a gel electrolyte. Calcium-sulphur designs are also being considered.

Sodium-ion



These batteries replace the lithium with sodium, a smart move as salt is rather easy to source. Sodium-ion batteries show potential with fast charge times and safety, but further development is required. One concept design from Germany's Karlsruhe Institute of Technology uses seawater to carry a charge.

Glass electrolytes

electrolytes

One of the challenges of a lithium-ion battery is that the liquid electrolyte is flammable. Maria Helena Braga at the University of Porto has developed a solid-state electrolyte using glass; her work was backed by John Goodenough, the Nobel-winning creator of lithium-ion batteries, and that's good enough for us.

THE FUTURE OF MAGAZINES

SUBSCRIBE AND SAVE

Camera checklists – Read before you buy!
Mirrorless Cameras, Digital RF Cameras & DSLRs
2025 TIPA AWARD WINNERS INSIDE
AUSTRALIAN
CAMERA
INSPIRE YOUR PHOTOGRAPHY
AUSTRALIA'S ONLY TIPA MEMBER
BEST IN CLASS
ALL THE TIPA WORLD AWARDS 2025 WINNERS
COMPETITION
BON APPÉTIT!
World Food Photography Awards 2025
ON TRIAL
POWER PACKED
Is Panasonic's Lumix S1RII King Of The Hybrids?
ON TRIAL
VERY HAPPY MEDIUM
Why Fujifilm's 100 Megapixels 'Compact' Is Hard To Resist
ON TRIAL
Zoom's H5studio Field Recorder Delivers Superior Soundtracks For Your Videos
ISSUE 432
A$11.95

INSIDE International Aerial Photographer Of The Year Winners
AUSTRALIAN
ProPhoto &video
CREATING YOUR PROFESSIONAL IMAGE
102 MEGAPIXELS TO GO
Fujifilm's Compact GFX100RF Packs A High-Res Punch
Zoom's H5studio
Field Recorder Adds Quality Sound To Your Videos
AWARDS 2025
The Big Ticks?

LONG LIVE CDs! 6 TOP TIPS FOR BUYING A NEW PLAYER
australian
hi-fi
DIGITAL DIVINE
THE BEST KIT ON THE PLANET
29 EXPERT-PICKED WINNERS INSIDE!
EISA
RARE BREED
SUPERPOWER
PRO ACTIVES

AUSTRALIA MADE
The Queensland luthiers taking a local approach to tonewood
TOMORROW NEVER KNOWS
How The Beatles' experimental classic changed studio recording forever
AUSTRALIAN
guitar
THE REAL PLAYER'S PICK
WIN! A ZOOM H5STUDIO HANDHELD RECORDER WORTH $599
BRIAN MAY
ON THE UPHILL BATTLE TO RECORD QUEEN'S DEBUT, THE GROUP'S LIFE BEFORE FAME, & THE RED SPECIAL
THE BIG INTERVIEW
QUEEN
SUPERCHARGE YOUR SOLOS
Seven pages on how to make your shredding shine + tips to spice up your blues scale licks
THE PRETENDERS
Chrissie Hynde: We're "holding the fort for bands"
THE RISE & RISE OF THE GIBSON SG

ULTIMATE WINDOWS 11 UPGRADE CHECKLIST
apc
19 PRO-QUALITY MONITORS MEGATEST
ENHANCE YOUR PHOTOS & VIDEOS WITH AI
WINDOWS 11
All your questions answered
COOL RUNNING
LG's DREAMY 5K OLED

AV MADE EASY
SOUND IMAGE
hi-fi
SOUNDBAR SUPERSTAR!
YAMAHA BRINGS BACK THE MAGIC BEAMS
PLUS
EISA AWARDS INSIDE TV & AV WINNERS!
DISCOVER YOUR NEW TURNTABLE!
Turntable Engineers: WHAT LPs DO THEY PLAY?

Subscribe at **www.techmags.com.au**

Free delivery across Australia | Never miss an issue | Save money

FUTURE

REVIEWS

Expert reviews and recommendations to help you buy with confidence

Lenovo
LEGION
Y
X
B
A

Reviews in this issue

27 **Alienware 16 Area-51**
28 **Lenovo Legion Go S (SteamOS)**
29 **Asus ROG Crosshair X870E Apex**
30 **LG UltraGear 45-inch OLED**
31 **Dell S2725DC Monitor**
32 **Contour Design Unimouse**
33 **SteelSeries Rival 3 Wireless**
33 **OnePlus Buds 4**
32 **Samsung Galaxy Fit3**
34 **Zoner Studio**
35 **Corsair Scimitar Elite WL SE mouse**
36 **Nothing Phone (3)**

APC is Australia's oldest consumer technology magazine – having been consistently in print for over forty years, since our first issue way back in May 1980 – and we take that heritage and responsibility very seriously. While our focus is obviously on the personal computer the very definition of the PC has changed and shifted markedly since the early 1980s.

As such, we touch on many other areas of everyday tech, too, from smartphones and apps to peripherals, accessories, and beyond. We have two goals: to find the best modern tech and to help you make the most of it.

Independent reviews

Championing technology doesn't mean we're unrelenting yes-men and -women, however, and *APC* aims to be as objective as possible in all our coverage. That means identifying the best products from multiple perspectives – the best performance, best value and best features and, ideally, the products that offer the best mix of these three attributes.

As a matter of policy, reviews published in *APC* are not shared with product-makers prior to print. We will contact vendors under certain conditions; for example, if we have a problem testing a product that seems to indicate it may be faulty, or to invite a vendor to clarify how a particular feature works. If an *APC* reviewer has any potential conflicts of interest involving a brand, the review will always be assigned to another writer.

Labs testing

APC strives to conduct the most rigorous, objective scientific tests and benchmarks we can so as to make our reviews as unbiased as possible. We use a variety of tools and programs for this, including many freely available benchmark suites for assessing media encoding, general system performance including storage read and write speeds, gaming and battery life.

APC EDITOR'S CHOICE

When a product scores 4.5 out of 5, it carries the Editor's Choice Award. These are products that exceed expectations and deliver a quality experience up there with the very best.

APC HIGHLY RECOMMENDED

You will see this award if a reviewed product has scored four out of five stars. It means most people can expect satisfying performance from the product, and that we would use it ourselves.

PRICE $5,540 **WEB** dell.com

Alienware 16 Area-51

A heavyweight gaming laptop that pushes performance to the next level, for a price.

The Area-51 is the latest premium gaming laptop from Alienware and comes in both a 16in and an 18in variant. We have the smaller 16in machine in the Labs – equipped with an Ultra 9 275HX CPU, Nvidia RTX 5080 16GB GPU and 32GB of RAM. With a launch price earlier in the year over $6,000, it's not a cheap machine, and if you upgrade to the RTX 5090 then the price tag hits almost $7,000. If you drop the spec down, it still costs a somewhat unappealing $4,497 for the RTX 5070 Ti model with just 16GB of RAM.

The Area-51 has the same excellent display as the cheaper 16X Aurora – a 16in 2560 x 1600 IPS panel with a 240Hz refresh rate, 500-nit brightness and full DCI-P3 colour coverage. In use it looks great, with sharp detail and vibrant tones, plus smooth motion thanks to the high refresh rate.

The Area-51 has a basic complement of ports that covers what is critical but omits useful options like Ethernet. You do get dual Thunderbolt 5 on the rear, as well as three 5 Gbps USB-A ports, HDMI 2.1 and on the side, an SD card reader and a 3.5mm audio jack. Then there's the latest Wi-Fi 7 and Bluetooth 5.4, plus a decent 1080p IR webcam that supports facial recognition logins. The sound from the speakers is clear and reasonably loud and the AlienFX per-key RGB keyboard feels solid and the build quality overall is excellent. That said, at 3.4 kg, it's undeniably chunky and certainly not a machine you want to haul around every day.

Gaming is where the Area-51 shows off what it can do. At the native 1600p resolution, the RTX 5080 is 35 to 55 percent faster than the RTX 5070 in the Alienware 16X Aurora, with some titles giving over twice the frame rates. Aside from being a more powerful card, the wider memory bus and 16GB VRAM mean fewer bottlenecks compared to 8GB cards and improving DLSS 4 support may widen the gap in the future. The Ultra 9 275HX processor is more than powerful enough to keep up with the GPU, and results from CPU-only workloads are top notch.

Noise and heat output are in line with what's expected for this class of laptop – quiet and cool most of the time but hot and fairly loud at full tilt, though more of a roar than a whine. Gamers will appreciate that the keyboard doesn't warm up too much, even after a long session. We didn't experience any major thermal throttling during testing, so the cooling system overall is matched to the rest of the spec.

Despite the large 96Wh battery, time unplugged is limited. We managed a normal 1 hour 20 minutes of gaming on battery and a disappointing 3 hours, 9 minutes of light work or web browsing. Video playback only stretched that slightly further to 4 hours, 27 minutes – the culprit here is unoptimised power profiles and no iGPU-only mode. ■

BENCHMARK RESULTS	Alienware 16 Area-51	Alienware Aurora 16X
CPU	Intel Ultra 9 275HX	Intel Ultra 9 275HX
GPU	RTX 5080	RTX 5070
RAM	32GB	32GB
Battery	96 Wh	96 Wh
Street Price	$5,540	$3,498
PCMark 10 - Overall (score)	8,639	8,437
Geekbench 6 - Multi-core	20,244	19,615
Geekbench 6 - Single-core	3,149	3,068
Geekbench 6 - GPU	213,178	136,686
PCMark 10 - Battery Work (HH:MM)	3:09	06:01
Cinebench R24 - CPU Single Core	133	133
Cinebench R24 - CPU Multi Core	2,106	1,964
3DMark SpeedWay	5,610	3,664
3DMark Port Royal	11,999	9,031
Steel Nomad	5,109	2,846
Cyberpunk 2077 - 1600p RT Low (DLSS)	114	76
Cyberpunk 2077 - 1600p RT Low (No DLSS)	79	50
Cyberpunk 2077 - 1600p RT Ultra (DLSS)	72	54
Cyberpunk 2077 - 1600p RT Ultra (No DLSS)	37	16
Black Myth Wukong - 1600p Cinematic	104	76
Shadow of the Tomb Raider	175	131
CrystalDiskMark Read (MB/s)	6,575	6,939
CrystalDiskMark Read(MB/s)	5,890	6,740

SPECS W11 Home; 16in IPS display, 2560 x 1600 resolution, 240Hz, 500 nits, 100% DCI-P3; Intel Ultra 9 275HX CPU; Nvidia RTX 5080 16GB GPU; 32GB 6400 MT/s DDR5 RAM; 1TB PCIe 4.0 SSD; 96Wh battery (4h 27min 1080p movie playback); 36.5 x 29 x 2.85 cm; 3.4 kg.

VERDICT

★★★⯪☆

The 16 Area-51 is bulky and expensive considering the spec, but is still one of the more capable 16in gaming laptops available.

Lindsay Handmer

PRICE $999 **WEB** lenovo.com/au

Lenovo Legion Go S (SteamOS)

Outshines the Windows version in every way.

This is an alternative model Legion Go that ditches Windows in favour of the Linux-based, gamer-oriented SteamOS. Aside from the new deep purplish colour, the design is identical, with an 8in IPS touchscreen flanked on either side by familiar gaming controls.

The chassis is an all-plastic affair, but it feels sturdy. Its weight of 740g is reassuringly substantial but not burdensome, and the rounded grips sit comfortably in your hands. It sports the same buttons and controls as the Windows version.

To test performance, I dug out the Windows version of the Legion Go S and installed the latest release of SteamOS. That might sound drastic, but I'd recommend it to anyone who owns the Windows edition: with the new OS the Legion Go S consistently outperformed its Windows-based benchmark scores, with 39fps in *Shadow of the Tomb Raider* versus 16fps, 32fps in *Dirt 5* against 20fps and 32fps in *Assassin's Creed Mirage* versus 21fps. All those scores are at maximum settings. Its advantage over the Steam Deck is smaller, think 4-5fps in most games, but still welcome.

What makes this achievement even more impressive is that the SteamOS handheld ran equally smoothly off the internal battery, still beating the Windows 11 version on mains power.

Aside from improved performance, SteamOS has another advantage over Windows 11: the user interface. Windows 11 isn't designed for a touchscreen of this size. SteamOS, on the other hand, is a perfect fit: buttons, menus and UI elements are sized just right, and respond appropriately to touch. From switching Steam profiles to changing Wi-Fi networks and configuring system settings, it's a breeze. Those wanting to dig into the underlying OS aren't left out, either: by pressing and holding the power button, you can bring up a menu that allows you to switch to Desktop mode and explore a full Linux environment.

Games look great on the Legion Go S. The 1,920 x 1,200 IPS display has a maximum refresh rate of 120Hz and good colour performance: 82% coverage of the DCI-P3 space. Brightness goes up to 441cd/m2, but even at 50% brightness I had no complaints about the visuals. Sunlight reflected atmospherically off muddy water on horse trails in *Red Dead Redemption 2*, while the neon glow and smoke-filled environments of *Cyberpunk 2077* created the perfect ambience.

Visually, at least; aurally, the Legion Go S's fans were always audibly running. The console never felt hot to the touch, even after an extended gaming session, but the fan noise interfered with the 2W speakers. And these were never exactly immersive.

The battery in the Legion Go S is rated at 55Wh, so I wasn't expecting endurance miracles. However, the small screen helps here, as I consistently enjoyed more than two hours of gaming at 50% brightness before needing to recharge, even with the detail settings turned up to maximum.

When I first saw the Legion Go S hardware running Windows 11, I wasn't smitten: the ergonomics and display were great, but the performance and value just weren't there. With an OS that's optimised for gamers, however, it's a much more persuasive deal, with tangible performance benefits and a gorgeously smooth all-round user experience. Incredibly, Lenovo has beaten Steam at its own game. ■

> "Even more impressive is that the SteamOS handheld ran equally smoothly off the internal battery, still beating the Windows 11 version on mains power."

SPECS 4-core/8-thread AMD Ryzen Z2 Go processor; AMD Radeon graphics; 32GB LPDDR5 RAM; 8in 120Hz IPS touchscreen, 1,920 x 1,200 resolution; 1TB M.2 PCIe Gen4 SSD microSD card reader; Wi-Fi 6E; Bluetooth 5.3; 2 x USB-C 4; 3.5mm combo jack; 2 x 2W speakers; 56Wh battery; SteamOS 299 x 128 x 22.6mm (WDH); 740g; 1yr C&R warranty.

VERDICT

★★★★☆

Puts the Windows 11 version to shame thanks to its snappy interface and far stronger performance.

Brandon Hill

PRICE $1,299 **WEB** rog.asus.com

Asus ROG Crosshair X870E Apex

A two DIMM AM5 board built for high memory speeds and modern I/O.

apc EDITOR'S CHOICE

The ROG Crosshair X870E Apex is a focused AM5 board aimed at builders and overclockers who care most about peak memory speed, clean signalling and voltage stability. It targets the Ryzen 9000 series, but also supports 8000 and 7000 series CPUs, with an ATX footprint and using a two DIMM layout to prioritise trace length and stability. In other words, if you want a home for very fast DDR5, dense NVMe storage and high-speed external devices, or to tweak settings and squeeze out performance, this is the board for you.

The memory system stands out with two slots – meaning shorter traces and better ability to hit higher frequencies and tighter timings. The Apex supports up to 128GB of DDR5 across two sticks, and overclocker Safedisk has broken records and pushed it beyond 10,000 MT/s. The board also has an overclocker's toolkit built in, with features like LN2 Mode, dual BIOS, voltage measurement points, pause switch and more. Aside from just competitive benchmarking, the board is very well suited to latency-sensitive gaming and workloads where stable high clocks mean more to you than having four DIMMs.

Storage is just as advanced and you can run five M.2 drives in total – three of which access PCIe 5.0 speeds with a Ryzen 9000 or 7000 installed, so both an OS and secondary drive can talk to the CPU's fastest lanes. The bundled DIMM.2 riser adds two PCIe 4.0 x4 sockets up to 22110, which makes it easy to keep game libraries and project assets on fast NVMe without falling back to SATA. Of course, there are 4x SATA ports too for older 2.5-inch drives or bulk storage.

You get two PCIe 5.0 x16 slots for a GPU and a second accelerator or capture card, plus a PCIe 4.0 x4 and a PCIe 3.0 x1 slot for anything else. The slot layout leaves room for large air coolers and thick graphics cards without colliding with headers or heatsinks.

Power delivery comes in at 18 110A plus 2 110A plus 2 80A stages with large heatsinks, which is an impressive amount of capability for a desktop platform. Real world, the beefy VRM means lower temps under heavy loads and more stability for those delving into manual tuning.

The ROG Crosshair X870E Apex I/O is comprehensive – on the rear you get 2x USB4 Type-C ports that can output DisplayPort 1.4a video, alongside 6x 10Gbps USB and 2x 5Gbps USB-A for other peripherals and a PS/2 combo port for when USB can't keep up with your overclock. Headers provide 2x 20Gbps USB Type-C, with one header capable of up to 60 W USB PD charging if you connect the auxiliary 8-pin PCIe power lead on the board. Networking is handled by Wi-Fi 7 and 5Gbps Ethernet, while audio comes from the SupremeFX ALC4080 with optical S/PDIF out.

At $1,299, the Apex creates a compelling premium sweet spot for overclocking focused motherboards, and yet it's $500 cheaper than the flagship Crosshair X870E Extreme, but adds a bunch of useful overclocking features compared to the $400 cheaper ROG Strix X870E-E. Well done Asus, well done. ■

VERDICT

★★★★½

A focused two slot memory layout and premium VRM mean the ROG Crosshair X870E Apex is well suited to getting the most from fast DDR5 and AM5 CPUs without totally blowing out the budget.

Lindsay Handmer

SPECS ATX, Socket AM5; 3x PCIe 5.0 M.2 plus 2x PCIe 4.0 M.2 via DIMM.2; 4x SATA; 2x USB4 Type-C with DP 1.4a out, 6x USB 10Gbps, 2x USB 5Gbps, header 2x USB 20Gbps Type-C; 2x PCIe 5.0 x16, 1x PCIe 4.0 x4, 1x PCIe 3.0 x1; Wi-Fi 7, 5 GbE; ROG SupremeFX 7.1 audio.

apc
EDITOR'S CHOICE

PRICE $3,499 **WEB** www.lg.com

LG UltraGear 45GX950A

The best gaming monitor in the world? It's hard to deny.

The LG UltraGear 45GX950A doesn't settle for anything less than being the best. Operating an enormous 5K/2K resolution with a 165Hz/330Hz refresh rate (depending on your preference), the UltraGear satisfies the needs of competitive and cinematic gamers alike – at a fairly high cost.

The display looks gorgeous across a wide range of applications, though its extreme size would often cost my eyes additional travel, a particularly annoying thing in competitive games and as a productivity tool alike. For this reason I'd consider it to be perhaps overkill for someone craving the most competitive experience, but just about right for someone like me, who adores gorgeous visuals above all else. The panel itself handles glare with ease and I never had any trouble with it.

For typing out documents in Canva and when viewing websites, the monitor was an exceptional asset, but it's too big to realistically use as a productivity monitor if that's what you really want (you'd be better off spending a lot less, I'd recommend the Dell S3225QC).

Meanwhile for gamers, I'd warn that you'll need to compress your HUD dramatically for the best experience. While the large screen looks undeniably gorgeous across a wide range of games, including *Marvel Rivals*, *Assassin's Creed Shadows*, *Battlefield 6*, *Cyberpunk 2077*, *Peak*, *Forza Motorsport* and *Helldivers 2*, you might actually find it to be a little too big – especially if your gaming space is quite small.

On the more technical side, the screen has no text blurring to speak of, nor any issues with sharpness provided you adjust it to your preference. Its colouring is brilliant and the OLED wraps the entire package together, with gorgeous darkness and contrasting for beautiful visuals. The OLED care program only cuts in when turning the monitor or the computer off, and it never obstructed my use.

There's a fairly expected range of ports here too, with a DisplayPort 2.1, two HDMI 2.1 ports, and a handful of USB ports. All ports are located around the back (except the 3.5mm, located on the underside) and there aren't any connectivity ports placed for the sake of being easily accessible.

And, of course, there's an RGB strip across the back that can be programmed to your preferred colour. The display's stand also has a fairly small footprint, so despite the screen's large dimensions, it won't actually take up a lot of space on your desk. Speakers are also included that sound great. Power is delivered by a brick, which connects to a C13 plug.

There's very little here that I think LG needs to change. The only thing I think is worth reconsidering is the placement of buttons – of which there are only two (a single multifunction nub for display settings and a quick button for 5K/2K toggling). These are centred at the bottom of the screen and are both quite small – I think the user experience would benefit from them being made larger and located on one of the sides.

Overall, after testing so many different monitors, the LG 45GX950A is one of the most impressive premium displays on the market – and if you're serious about gameplay, you must at least consider this screen. ■

SPECS 44.5-inch, matte, 5120 x 2160, VESA DisplayHDR 400, 330Hz, OLED. 0.03ms response time. 275-nit brightness. 1.5M:1 contrast. 2x HDMI 2.1, 1x DisplayPort 2.1, 1x USB-C, 2x USB-A. Tilt, Swivel and Height adjustment: Yes (+10° ~ -15°/ 0~11.9cm). 991.6 x 460.7 x 225.5mm, 14KG.

VERDICT

★★★★★

It'll be hard to find a better gaming monitor than this – if you don't mind an ultrawide curved screen.

Zachariah Kelly

PRICE $399 **WEB** www.dell.com

Dell 27 Plus QHD USB-C S2725DC

Getting all the basics right.

DRONES
Easy to fly, hard to give up.
Buy Now
MON
TUE
WED
THU
FRI
SAT
SUN
Someplace Else
Brand New Wave
Austin, TX
24°C
76°F
DELL

The Dell 27 Plus QHD USB-C S2725DC pitches itself as a bit of an everyman option for everything from productivity work through to entertainment. It keeps its price moderate through the use of an IPS LCD panel rather than OLED, so we're not in best-of-breed gaming territory here – but then it's not priced like those monitors either.

Setup of the Dell 27 Plus QHD USB-C S2725DC is simple enough with a classic multi-part locking panel that attaches to the off-white base. Dell refers to it as "Ash White", but it's rather distinctly more on the beige side, really. That colour choice did give me pause for thought around how it might look over time, because beige or white monitor surfaces show dust, grime and any scuffs far more easily than black ones.

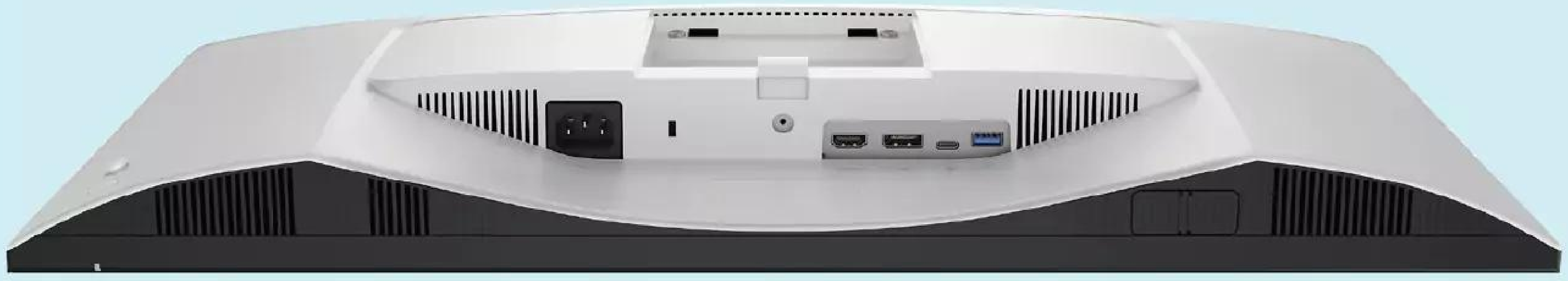
Monitor connectivity is handled from rear downwards facing single HDMI, DisplayPort or USB-C, working well as tested across both PC and Mac platforms. You'll need to supply your own HDMI or DisplayPort cables, but if you do fancy simpler USB-C connectivity to a laptop on the go, a 1m USB-C to USB-C cable is supplied in the box.

That's not where the Dell 27 Plus QHD USB-C S2725DC's cable journey finishes, however, because at the back you'll also find a USB-A 5Gbps port, while the front hides a drop-down USB hub with single USB-A and USB-C power ports. It's a pity that the front-facing USB-C port is downstream only and doesn't support video, because that would make it far more flexible for get-up-and-go laptop work; the alternative here is to leave a trailing USB-C cable or fiddle around lifting the monitor every time to find the rear USB-C socket.

The S2725DC's joystick control is easy enough to work with and can be customised within its own UI for shortcuts to your most commonly used features, although the presets will likely suit everything you do on a regular basis. As with everything Dell, if you want firmware updates or more customisation, you'll need to install Dell's Display and Peripheral Manager software to do so.

The S2725DC features integrated speakers with preset audio profiles for movie, game, music or voice playback plus a customisable equaliser, but even with tweaking there's a lot reverb in presented audio which isn't particularly pleasant; you'd be much better off with a decent set of gaming headphones or desktop speaker set depending on your usage preferences, especially if you need to adjust audio frequently as the inbuilt joystick control, while functional is a clumsy tool for such a task.

At a maximum resolution of 2560x1440 at 144Hz and with a claimed 1ms MPRT, the Dell 27 Plus QHD USB-C S2725DC presents well for most tasks including moderate-level gaming, though those with broader eSports ambitions will still want to look to a dedicated and faster gaming monitor. If you're after a general all-purpose monitor – as long as you opt for external speakers – then the Dell 27 Plus QHD USB-C S2725DC presents solid value. ■



SPECS 27-inch, 2,560 x 1,440 16:9, 144Hz, IPS; 1ms response time; 350-nit brightness; 1,500:1 contrast; Ports: 1xHDMI (HDCP1.4), 1xDisplayPort (HDCP1.4), 1xUSB-A 5Gbps downstream, 1xUSB-A 5Gbps upstream, 1 USB-C 5Gbps upstream port (DisplayPort1.4 Alt. Mode, Power Delivery up to 65W), 1 USB-C 5Gbps upstream port (DisplayPort1.4 Alt. Mode, Power Delivery up to 65W), Tilt -5° to +21°, 90 degree rotation; Dimensions: 355.98x611.34x58.87mm (HxWxD excluding stand) 6.48kg.

VERDICT

★★★½☆

A good-all rounder monitor choice for your everyday computing tasks – and just a little bit of fun too.

Alex Kidman

SPECS Connect using 2.4GHz wireless or USB-C; Right- or left-handed options; Seven buttons; 4,000dpi; 56x119x76mm (HxWxD); 141g; One-year warranty.

apc HIGHLY RECOMMENDED

PRICE $199 **WEB** contourdesign.com

Contour Design Unimouse

It's all about the angles.

This wireless ergonomic mouse has a unique split-folding, adjustable design that lets you set the exact angle for your wrist. With a range between 35 and 70 degrees, it lets you start with a flatter angle and gradually increase it – ideal if you're transitioning from a traditional mouse. The hinge mechanism for adjusting this angle can be quite stiff, but it remains stable while in place, and it doesn't wobble.

While it looks basic, the Unimouse feels premium thanks to textured padding where your fingers rest. Overall, it works well, gliding effortlessly across surfaces with well-placed main buttons that are easy to reach.

The companion Windows app offers a range of customisation tools, allowing you to reassign button functions and create shortcuts making it easier to streamline common tasks.

After a full day of use, one of the five LED indicators turned off, suggesting the battery had dropped by at least 20 per cent. That's not particularly impressive, but the Unimouse does include a USB cable for wired use – so you can keep working while it charges. There's also a wired version available for if you'd rather not have to recharge. It sells for essentially the same price.

At $199, the Unimouse is relatively expensive – especially with alternative ergonomic models from the likes of Logitech available for around $85. However, most of those are fixed-angle designs. ■

VERDICT

★★★★☆

A comfortable and customisable ergonomic mouse that can sit at the perfect angle for your wrist.

***APC* staff**

Sat, Oct 28
10
08
3457
89
100%

apc HIGHLY RECOMMENDED

PRICE $95 **WEB** samsung.com

Samsung Galaxy Fit3

Don't let the low price fool you.

Samsung doesn't typically focus on budget products, so this fitness watch stands out. Its $95 price tag significantly undercuts rivals such as our current favourite, the Fitbit Charge 6, which sells for around $198.

Samsung includes all its services and its Health app in the price, so there are no hidden subscriptions needed to access more services. Note, however, that there's no iPhone version of its app, so it's for Android users only for now.

The Fit3 has a large, bright AMOLED screen that can accommodate plenty of data. It monitors a range of fitness stats including steps walked, calories burned, heart rate, stress levels and sleep. It also offers smartwatch-style notifications and music controls, plus weather information and a collection of customisable watch faces. Navigating through screens is easy and enjoyable thanks to its responsive touchscreen and clear menu design.

What the watch can't do on its own is track your exercise via GPS. You can still do this by connecting it to a smartphone, but if you head out and leave your phone behind, the watch will try to guess the distance travelled. It means that while we found features such as measuring heart rate worked well, it was inaccurate when judging distances without a phone, which is the main reason why we still prefer the Charge 6.

Samsung says the battery lasts 13 days in full. In our test it lasted 10 days, during which we tracked three short runs and wore the watch overnight. Recharging fully from zero took 68 minutes. ■

VERDICT

★★★★☆

A great-value fitness watch that's easy to use, but you'll need a phone to use GPS.

***APC* staff**

SPECS 1.6in 256x402 pixel AMOLED screen; Up to 13 days' battery life; Bluetooth 5.3; IP68 ingress protection; 43x29x9.9mm (HxWxD); 18.5g; One-year warranty.

PRICE $79 **WEB** steelseries.com

SteelSeries Rival 3 Wireless (Gen 2)

A thoroughly decent and affordable wireless mouse.

The SteelSeries Rival 3 Wireless (Gen 2) has plenty going for it and all for a reasonable price. Open the box and you'll find the mouse itself (available in black, white, light blue or lavender), a USB-A wireless dongle and two AAA batteries. The latter aren't rechargeable but should last around 200 hours, though the Rival 3 accommodates rechargeable AAA batteries if you have them.

The Rival 3 is relatively small and usable by both right- and left-handers. The moulded design fits snugly in your palm but it lacks the ergonomic trappings of the likes of the $85 Logitech Lift Vertical Mouse, similarly priced alternative that's comfortably shaped to better support right-handed users

Build quality is solid, with no flexing, tight seams and a robust feel to the plastic case. The entire rear section houses the battery compartment, but thankfully the lid is firmly attached. There's also a slot for storing the dongle inside the mouse, which is useful if you often switch between devices or mostly use Bluetooth.

We've seen more expensive mice with higher optical resolutions than its 18,000dpi, but its sensor was precise and smooth in our tests, and the buttons were consistently clicky and bouncy. The associated app lets you remap your buttons, assign macro shortcuts and enable high-efficiency mode, which extends battery life by reducing sensitivity and deactivating the lights. ■

VERDICT

★★★★☆

A wireless mouse that's built to last, though you will have to keep replacing its batteries.

***APC* staff**

SPECS SteelSeries TrueMove Air Optical Sensor; 18,000dpi; 1,000Hz polling rate; Six programmable buttons; Connects via Bluetooth 5.0 or 2.4GHz USB receiver (included); Requires 2x AAA batteries; 38x67x121mm; 106g (with batteries); One-year warranty.

SPECS 11mm woofers; 6mm tweeters; 45-hour battery life with case; Active noise cancellation; Bluetooth 5.4; IP55 ingress protection; 4.7g per bud; One-year warranty

PRICE $130 **WEB** oneplus.com

OnePlus Buds 4

Good value, but Bluetooth fiddles hold it back.

This fourth generation of earbuds from Chinese manufacturer OnePlus has made an impressive leap in quality and features – specifically its noise-cancelling, which is the best we've come across at this price. In our tests, it completely eradicated background noise, no matter how loud it was. Previously, you'd need to spend twice the price of these earbuds to find noise-cancellation as good as this.

The design is also top notch. The buds themselves weigh less than 5g each and are incredibly comfortable to wear for long periods. Likewise, the charging case is small and lightweight.

Overall sound quality is outstanding, with a strong focus on bass, but this is well balanced with higher notes, which are never drowned out. Vocals, guitar rhythms and piano harmonies all come through with clarity and definition, enhancing those meaty lower frequencies. In other words, music sounds punchy and vibrant through these buds.

This might have added up to a five-star review, but the connection between the buds and the app that controls the buds reset every time we put them away. This means you have to reconnect them through your phone's Bluetooth settings every time you use them, which is a hassle we could do without. As an alternative, the $189 Sony WF-C710N noise cancellation isn't as good, but a better app makes them easier to use.

Battery life is also a bit of a letdown, lasting just six hours with noise cancelling active, though this stretches to 11 when it's switched off. Thankfully, the case provides enough charge to keep them topped up for 45 hours. ■

VERDICT

★★★★☆

Classy earbuds with superb noise-cancellation, though a low battery life and fiddly app take the edge off.

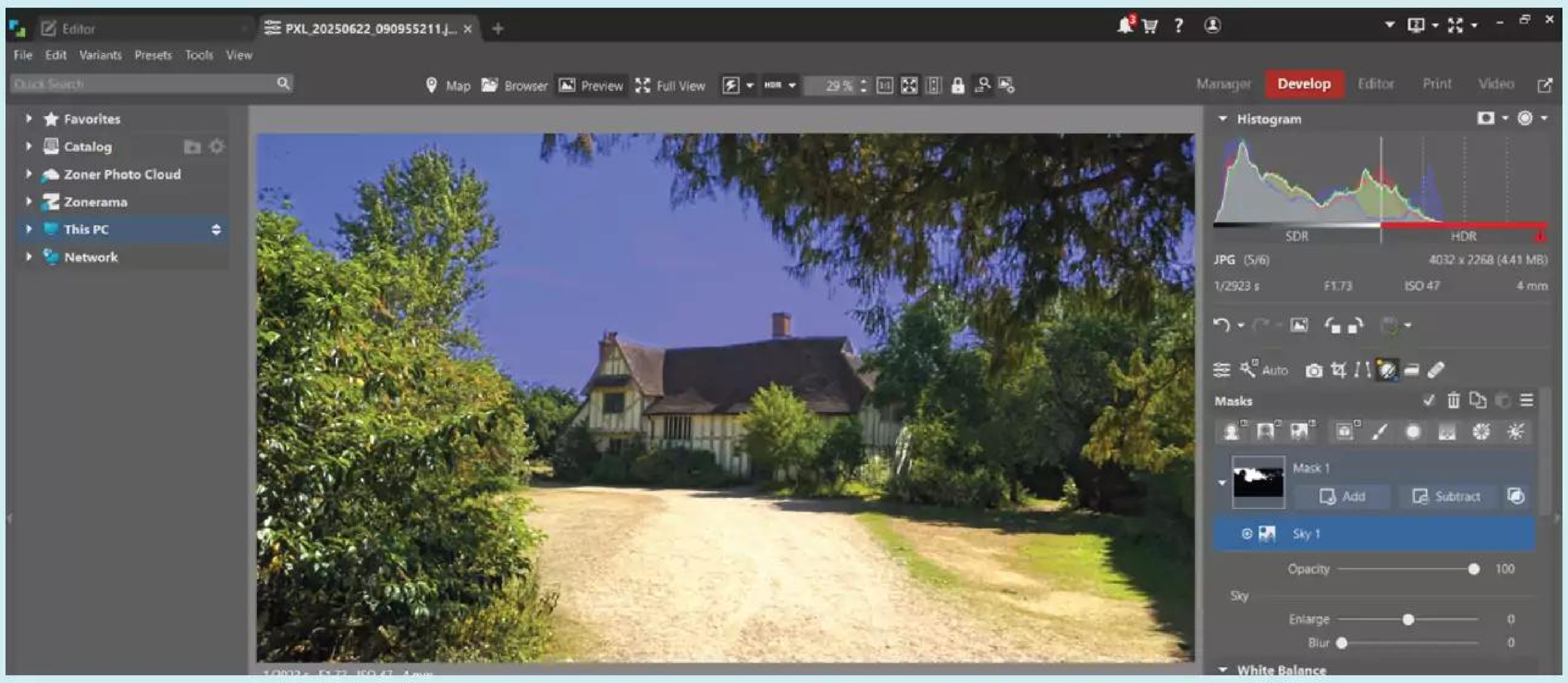
***APC* staff**

PRICE US$59 per year **WEB** zoner.com

Zoner Studio

apc HIGHLY RECOMMENDED

Edit your photos without the usual pro-level cost.


Editor
PXL_20250622_090955211.j...
File
Edit
Variants
Presets
Tools
View
Quick Search
Map
Browser
Preview
Full View
29 %
Manager
Develop
Editor
Print
Video
Favorites
Catalog
Zoner Photo Cloud
Zonerama
This PC
Network
Histogram
SDR
HDR
JPG (5/6)
4032 x 2268 (4.41 MB)
1/2923 s
F1.73
ISO 47
4 mm
Auto
Masks
Mask 1
Add
Subtract
Sky 1
Opacity
100
Sky
Enlarge
0
Blur
0
White Balance

Zoner Studio is a Windows-only take on both Photoshop and Lightroom. It isn't as powerful as either, although a slew of regular updates is changing that, but it's a good entry-level/intermediate photo editor and organiser for a reasonable price. After a recent name change from Zoner Photo Studio X to Zoner Studio, I tested the latest version to see how it measures up against the best Adobe Photoshop alternatives.

For me, the pricing is a big plus. There isn't a free version available, only a free trial, but Zoner Studio's US$59 per year cost is low when compared to the $30.99-per month Adobe demands for Photoshop and Lightroom. Zoner Studio leans more towards entry-level users who want to build their skills.

You'll have no problems navigating Zoner Studio, which is a big aspect of its appeal. The main part of the screen is devoted to your selected image, with files and folders beneath that can be scrolled through. It's a nice touch, making navigation that much easier.

Your photos are always accessible in Zoner, since there's a file explorer tab to the left of the screen. Photos appear on a timeline at the foot of the main panel. When you've selected your image, it can then be edited and adjusted via the Editor tab.

All the familiar image-editing tools are here, from cropping and rotating to adding watermarks or directional blurring. Predictably, there are heaps of tools for toying with the exposure (shadows, contrast and so on), white balance (temperature and tint) and colour (such as saturation). I also like the addition of the tone curve, as you'd find in Lightroom, for lightening or darkening an image, or bringing specific colour channels to the fore.

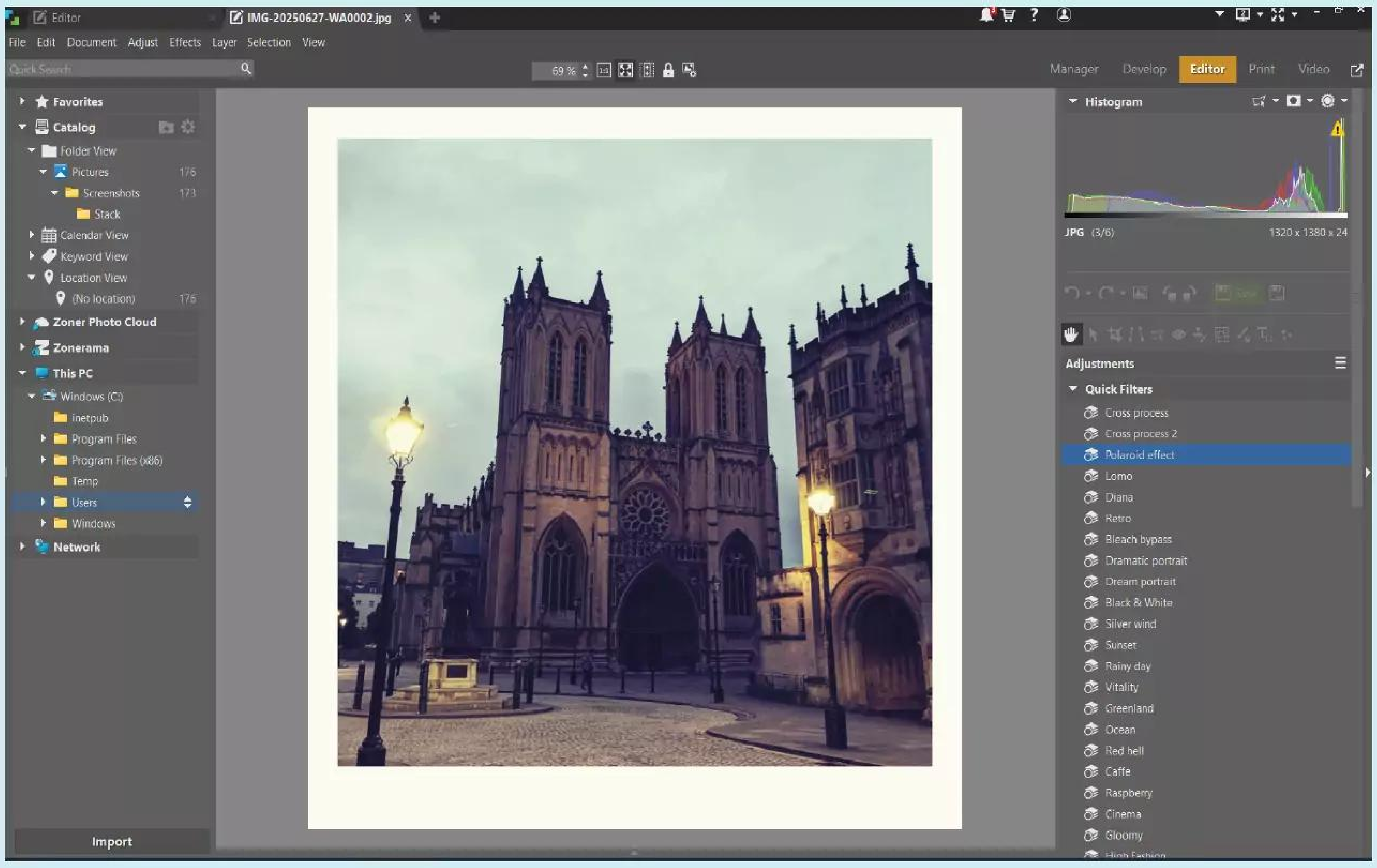
There's also a Quick Edit option, which populates the panel with the core tools most photographers and designers use without needing to fumble through the menus. The editing process can further be streamlined with the likes of Quick Fix and – ideal for social media – Quick Filters. All of these work instantly, just a press of the button.

The software includes AI-powered tools, all of which deliver good results impressively quickly. These include AI Masking, found in the Develop tab. Choosing this gives you the option to let Zoner automatically select the photo's subject, background, objects or sky for fine-tuning. For anyone looking to streamline their workflow, these are must-use tools, and I was pleased with the speed and accuracy here.

One of the stand-out tools is the AI Background Remover. Once it completed its work, I could quickly add a colour background or create a transparent one for compositing into other images. Occasionally, the process removed elements of the subject – typically when on darker or similarly coloured backgrounds – but I had no serious complaints with this one-click background removal tool.

Perhaps the biggest issue, at least for those looking to make the switch from Photoshop, is the lack of support for .PSD files. Instead, the software uses its own .ZPS files, which work the same with layers and effects, but there's no way to import Photoshop files into the app.

Overall, Zoner Studio packs in a wealth of tools for photo editing. It will take some getting used to if you're new, but absolutely no time at all if you're already familiar with recent generations of photo editors. ■


Editor
IMG-20250627-WA0002.jpg
File
Edit
Document
Adjust
Effects
Layer
Selection
View
Quick Search
69 %
Manager
Develop
Editor
Print
Video
Favorites
Catalog
Folder View
Pictures
176
Screenshots
173
Stack
Calendar View
Keyword View
Location View
(No location)
176
Zoner Photo Cloud
Zonerama
This PC
Windows (C:)
inetpub
Program Files
Program Files (x86)
Temp
Users
Windows
Network
Import
Histogram
JPG (3/6)
1320 x 1380 x 24
Adjustments
Quick Filters
Cross process
Cross process 2
Polaroid effect
Lomo
Diana
Retro
Bleach bypass
Dramatic portrait
Dream portrait
Black & White
Silver wind
Sunset
Rainy day
Vitality
Greenland
Ocean
Red hell
Caffe
Raspberry
Cinema
Gloomy
High Fashion

VERDICT

★★★★☆

This photo-editing app is loaded with all the core tools that intermediate users will need to fine-tune images.

Steve Clark

PRICE $195 **WEB** corsair.com

Corsair Scimitar Elite Wireless SE

A button for everything you can think of.

Whether MMO devotee or Stream Deck power user, the new edition of the Scimitar Elite is another gaming mouse for the macro-happy among us. While MMO users and streamers are hardly "niche" categories – especially when combined – there's an interesting dearth of button-heavy gaming mice on the market: it's definitely a market that Corsair and Razer have cornered, with other brands struggling to make a dent.

1
2
3
4
5
6
7
8
9
10
11
12
//SCIMITAR

The new model of the Scimitar Elite wireless offers at least one reason for this: Corsair has mostly nailed the feel and form factor of a 16 button rodent. On the left side of the mouse are 12 programmable switches, over which it's possible to rest one's thumb without triggering them, because they require a bit – but not a lot – of pressure brought to bear. If you're not happy with the exact location of these buttons, it's possible to shift them forward or backwards using an included allen key. A DPI switch sits between the main left and right mouse button switches, just above the scroll wheel whose notches are slightly on the subtle side.

On the underside there's a switch for toggling between up to three onboard profiles, a switch for selecting wireless or Bluetooth connectivity, and – and this is important – a discrete little storage compartment for the wireless dongle. Don't be like us: we spent an hour searching for this dongle, which we'd thought had fallen out of the box onto our desk or the carpet.

Like the earlier, non "Special Edition" model, the Scimitar Elite offers great lag-free wireless connectivity and all the usual RGB trimmings, which are controlled via Corsair's slightly ropey iCue software. The differences here aren't immediately apparent, but they're there. Battery life has been upgraded to an advertised 150 hour lifespan, which can be increased by using the more power efficient Bluetooth, or turning off the fancy lights. There's also a new 33k DPI "Marksman S" sensor which, let's be honest, is way too high for most (or any!) use cases, but it demonstrates that this mouse is about as sensitive as they come without getting sportscar stupid.

The Scimitar Elite's Stream Deck functionality is customisable via the Stream Deck software, meaning you can by-pass iCue if that's how you intend to use the side keys. For everything else, the iCue software is needed, and as far as peripheral software goes it's not too painful. Assigning functions to the side buttons is relatively easy: you can assign a shortcut to each button ranging from function keys, media navigation, and even full streams of text (it'll take the labour out of insulting your healer). As usual, RGB customisation also happens here, as does DPI stage tweaking. It's not bad software, but it would be nice if Corsair (and developers of other similar programs) could increase the text size and perhaps sacrifice some flair for a more intuitive user interface.

In use the Scimitar Elite is remarkably light considering its features, and while the left and right button clicks do feel a little mushy compared to some of the competition, that's more to do with the sound and the device's lightweight frame: it doesn't impact accuracy at all. Another slight – and totally subjective – shortcoming is the texture of the mouse itself, which is a little shinier and more slippery compared to what this reviewer prefers. ■

SPECS 33,000 DPi; 1,000Hz polling rate; Sixteen programmable buttons; Connects via Bluetooth 5.0 or 2.4GHz USB receiver (included); Built-in lithium-polymer battery with 150 hours; 42x73x119mm; 114g (with batteries); Two-year warranty.

VERDICT

★★★★½

Whether you're a streamer, MMO player, or just a shortcut lover, the Corsair Scimitar Elite SE offers oodles of customisation and flair with few sacrifices made to comfort.

Shaun Prescott

> “The Phone 3 makes a visual statement. With its transparent back panel, exposed screws and as many greebles as the sides of a starship, it’s unmistakeably a Nothing handset.”

apc
HIGHLY RECOMMENDED

PRICE 256GB, $1,509 **WEB** au.nothing.tech

Nothing phone (3)

This phone is a little bit different.

From a few grey imports, to a tentative Australian online sales presence, British company Nothing has recently gone big here and its products are now easily available and supported. You’ll be hearing a lot more from Nothing, as all new products are expected to be officially sold in Australia. That’s good news, because Nothing’s gear is compelling, generally offers excellent value, and the unique design aspects really set it apart from the rest.

But let’s get the painful bit out of the way: the Nothing Phone 3 costs $800 more than 2023’s Nothing Phone 2. That puts it head to head with the Samsung Galaxy S25 and the Google Pixel 9, although as usual with Nothing it offers a specification, a design and most of all an attitude all of its own. The standard model comes with 12GB RAM and 256GB of storage – a good amount for a phone of this price – or you can go up to 16GB RAM and 512GB storage for $1,689, which isn’t bad for twice the storage capacity and a third more RAM.

Whether you choose the black or white finish, the Phone 3 makes a visual statement. With its transparent back panel, exposed screws and as many greebles as the sides of a starship, it’s unmistakeably a Nothing handset. However, the signature pulsing Glyph lights on the rear have been replaced with the Glyph Matrix – a small circular display that’s capable of communicating much more than the old LEDs ever could, and which can be controlled with a dedicated action button on the rear.

The main display is a clear step up from the Phone 2, with a higher resolution, higher brightness ratings and faster touch sampling, along with the same 120Hz adaptive refresh rate. It’s not as bright as the Google Pixel 9 Pro XL, but that’s not surprising – the latest Pixel outshines all other smartphones we’ve tested.

Another notable change is the addition of a 3x telephoto camera to the previous model’s main and ultrawide cameras, all of which offer a native 50MP resolution. While it’s great to have this extra shooting option, the Nothing Phone 3’s images don’t quite match up to the best phones on the market: they’re good, but I felt my tests shots looked a little flat compared to the Google Pixel 9 Pro XL, and not as sharp or detailed as those taken on the Samsung Galaxy S25 Ultra.

Still, the new zoom module works well, picking up lots of colour and detail. I’m pleased to see a telephoto macro mode too, allowing you to stand well back from small subjects and not block out the light.

SPECS 8-core (3.2Hz/3Hz/2.8GHz/2GHz) Qualcomm Snapdragon 8s Gen 4 SoC; 12GB/16GB RAM; Adreno 825 graphics; 6.7in 120Hz AMOLED screen, 1,260 x 2,800 resolution; 5G; 256GB/512GB storage; dual nano-SIM; IP68; triple 50MP/50MP/50MP rear cameras; 50MP front camera; Wi-Fi 7; Bluetooth 6; NFC; 5,150mAh battery; USB-C 2 connector; Android 15 (5 major updates); 76 x 9 x 161mm (WDH); 218g; 1yr RTB warranty.

Under the hood

Inside, a mid-range Snapdragon 8S Gen 4 processor runs the show. This helps keep the price down, and while the Phone 3 lagged behind the Samsung Galaxy S25 in the Geekbench CPU and 3DMark GPU tests, the performance gap isn't noticeable in everyday use. I was happily able to play *Ex Astris* with maximum graphical settings at a solid 60fps – and while the phone did get rather hot in the top left corner, I had no problem holding it perfectly comfortably.

The Phone 3's battery uses the latest silicon-carbon materials to make the cell more energy dense, meaning it can cram 5,150mAh of capacity into a compact space. However, in my YouTube-based battery test I found the Phone 3 drained 22% of its battery after three hours of continuous playback, while the Galaxy S25 Ultra and Pixel 9 Pro XL, both with similar-sized batteries, only dropped by 15% on the same test.

Still, recharging is quite quick. Using a generic 50W charger I was able to get an empty battery back up to 39% in 15 minutes, 68% in 30 and 100% in 52 minutes. Nothing promises it'll take just 19 mins to reach 50% using one of its own 65W chargers, and there's support for 15W wireless charging too.

Unique UI

The Nothing OS 3.5 system software is based on Android 15, with a dot-matrix look and monochrome colour scheme that emphasise the Phone 3's uniqueness. The most notable custom feature is the Glyph Matrix I mentioned earlier, which supports a surprisingly wide variety of functions. Some are purely practical, such as showing your battery level, reflecting the time of day or acting as a digital spirit level to check if your newly assembled table's properly flat; others are purely for fun, like the Spin the Bottle, Magic Eight Ball and Rock-Paper-Scissors modes. I like all of them, and there's an SDK available for third-party developers to add their own functions.

Elsewhere, the Essential Space and Essential Key features have returned from the Nothing Phone 3a, to quickly capture screenshots, photos and voice memos, and catalogue the information they contain. The new Essential Notifications feature smartly filters your notifications based on contacts, apps and keywords – then pops up glyphs on the back, to alert you about what awaits you when you turn the phone over.

If you're hungry for more, Nothing OS 4.0 (based on Android 16) is promised by the end of the year, along with five years of further OS updates beyond that and seven years of security updates. That's not quite on par with Samsung and Google's full seven-year pledges, but it should cover the whole time you're likely to be using this phone.

The Nothing Phone 3 is clearly no ordinary smartphone, and to be honest that'll probably put many people off. The substantial price increase over last year's Nothing Phone 2 stings too. However, it pays for a fine hardware specification: if you like a bit of novelty and personality from your tech, while still needing a handset that's powerful and versatile enough for everyday use, there's really nothing else out there like the Phone 3. ■

VERDICT

★★★★☆

The most expensive Nothing phone yet also packs in the latest tech, a zoom camera and a distinct design.

Richard Priday

NEEDS Windows 7, 8.1. 10 or 11 **WEB** photodemon.org

PhotoDemon 2025.4

Image editor.

We've recommended several free image editors recently, including GIMP and Photo Variants. PhotoDemon is easier to use than those programs and lighter on system resources – its developer wants it to be "the smallest, lightest photo editor money (can't) buy".

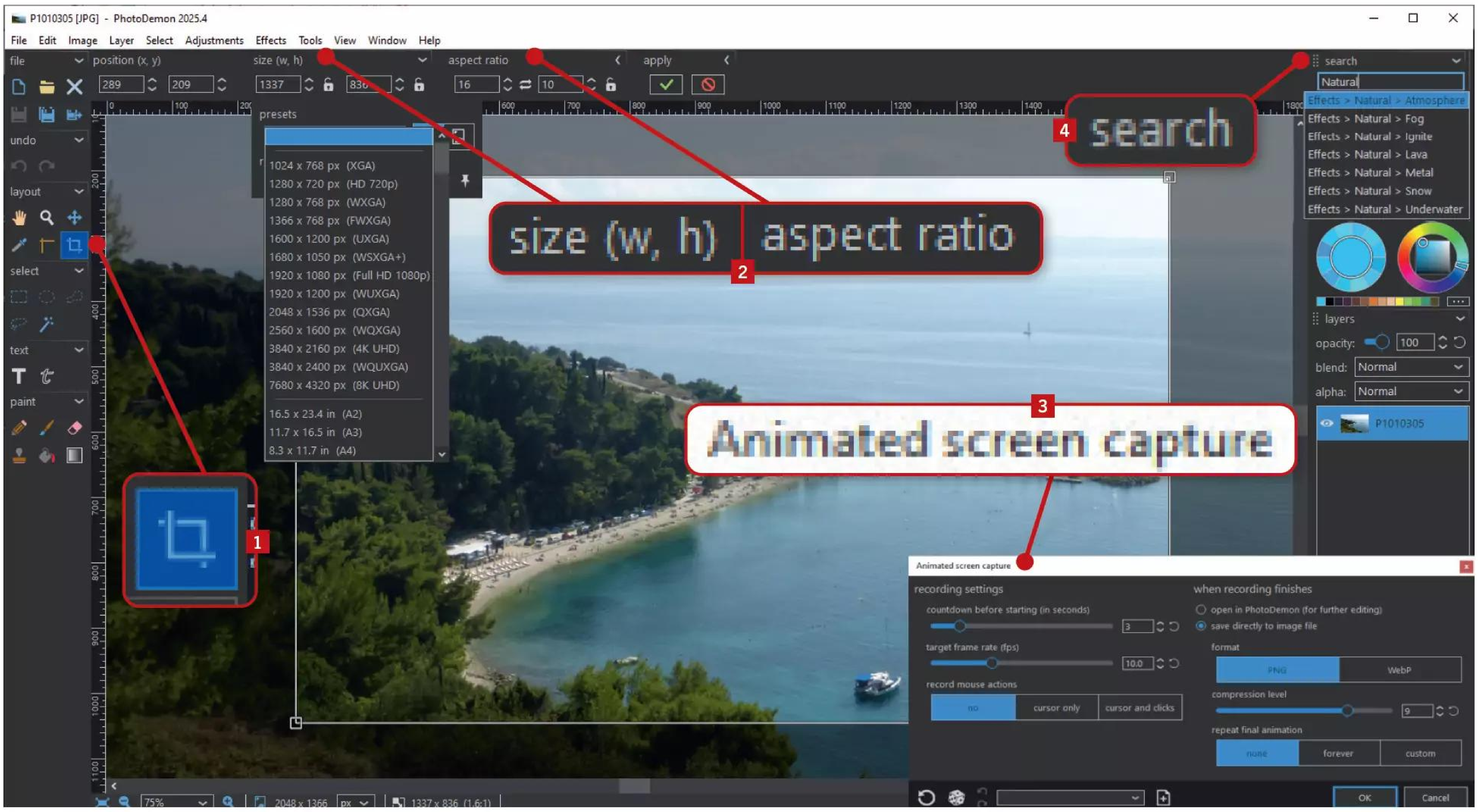
This new version introduces a memory-management feature, similar to the one in some web browsers. When you're working with lots of large photos, PhotoDemon will automatically suspend 'inactive' images (those you're not currently editing) to free up RAM. This only happens when memory is running low and ensures the software doesn't cause your system to freeze. When you switch back to an inactive image, PhotoDemon will restore the required RAM.

However, the most notable new feature in PhotoDemon 2025.4 is a new Crop tool. Previously, to crop an area of an image, you needed to first click a Selection tool in the toolbar, such as Rectangular, Elliptical or Magic Wand. The new tool is 'on-canvas', which means you can simply drag your cursor over the area to crop, as in many other image editors.

PhotoDemon's Options box, which you access via the Tools menu, has been redesigned so that it's faster to load and easier to navigate. Options are now organised into logical categories, such as Performance, Saving and 'Color management'. There's also a Fonts category, which lets you change the default font of PhotoDemon's interface – including to Comic Sans.

Another useful addition repairs images with incorrect file extensions, which sometimes happens with pictures you download from the web. If PhotoDemon detects, for example, a WEBP image with a PNG extension, it will offer to fix it so you can open the file in other programs as well.

Finally, if you don't like the splash screen that briefly appears when you launch PhotoDemon, you can now turn it off. Click 'Loading' in the Options box and untick 'display splash screen'.

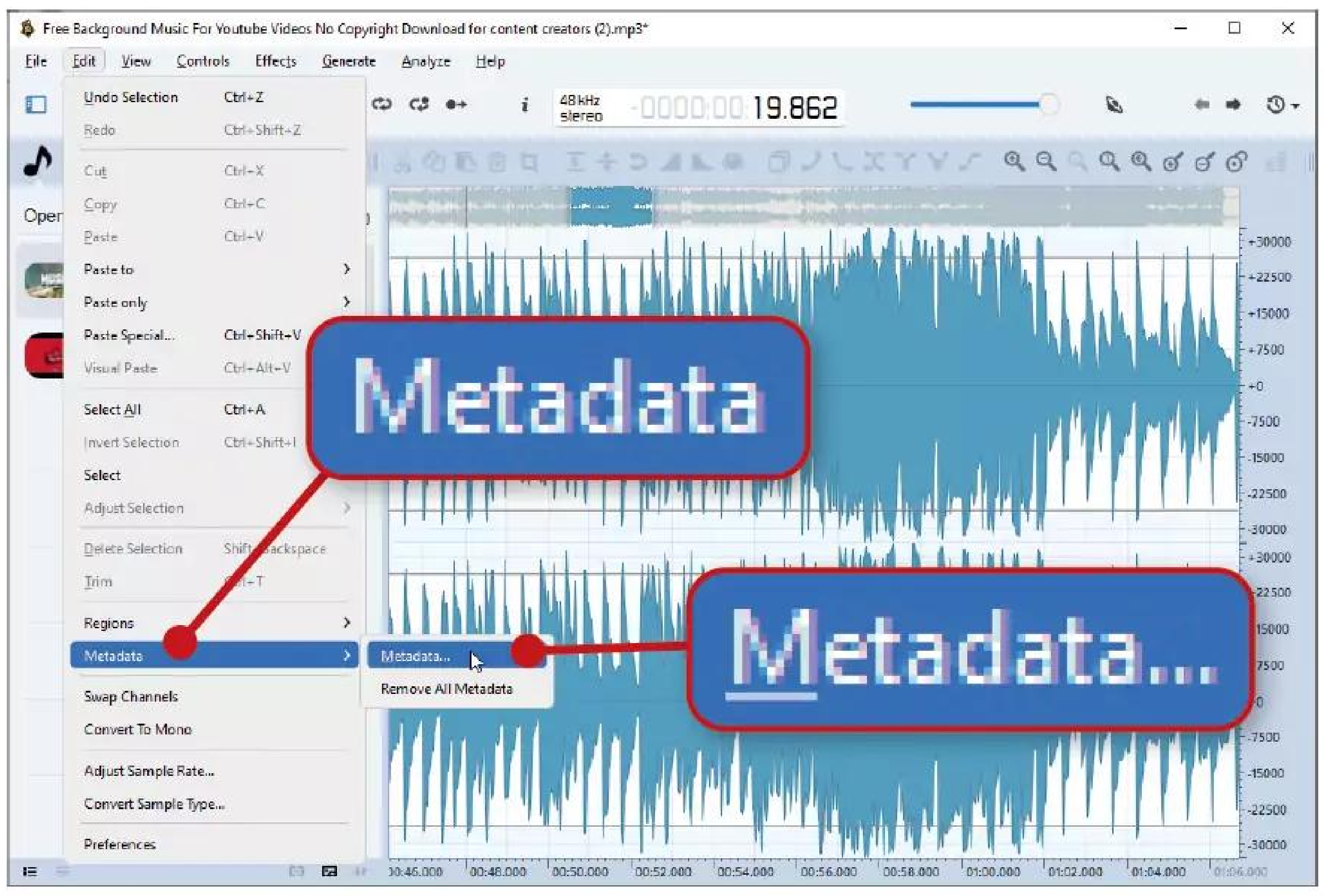

P1010305 [JPG] - PhotoDemon 2025.4
File
Edit
Image
Layer
Select
Adjustments
Effects
Tools
View
Window
Help
position (x, y)
size (w, h)
aspect ratio
apply
presets
search
Natural
Effects > Natural > Atmosphere
Effects > Natural > Fog
Effects > Natural > Ignite
Effects > Natural > Lava
Effects > Natural > Metal
Effects > Natural > Snow
Effects > Natural > Underwater
layers
opacity:
blend: Normal
alpha: Normal
1
2
3
4
search
size (w, h)
aspect ratio
Animated screen capture
Animated screen capture
recording settings
countdown before starting (in seconds)
target frame rate (fps)
record mouse actions
no
cursor only
cursor and clicks
when recording finishes
open in PhotoDemon (for further editing)
save directly to image file
format
PNG
WebP
compression level
repeat final animation
none
forever
custom
OK
Cancel

1 The new on-canvas crop tool in PhotoDemon makes it much easier to select an area of an image to crop. Just ensure the Crop tool is active in the left-hand toolbar (it is by default). Press 'C' to activate it without clicking.

2 To crop the selected area of an image to a particular size or aspect ratio, click either of those labels in the top toolbar and select an option from the Presets dropdown menu. Click the green tick button on the toolbar to carry out the crop.

3 One of PhotoDemon's cleverest features lets you capture animated screenshots, which are like GIFs but higher quality. Click the Tools menu and select 'Animated screen capture, to record an area of your screen.

4 To find a particular tool in PhotoDemon, start typing its name into the search box in the top-right corner. This will tell you which menus and sub-menus contain matching keywords. Select a result to open the relevant tool directly.



AUDIO EDITOR

Ocenaudio 3.15

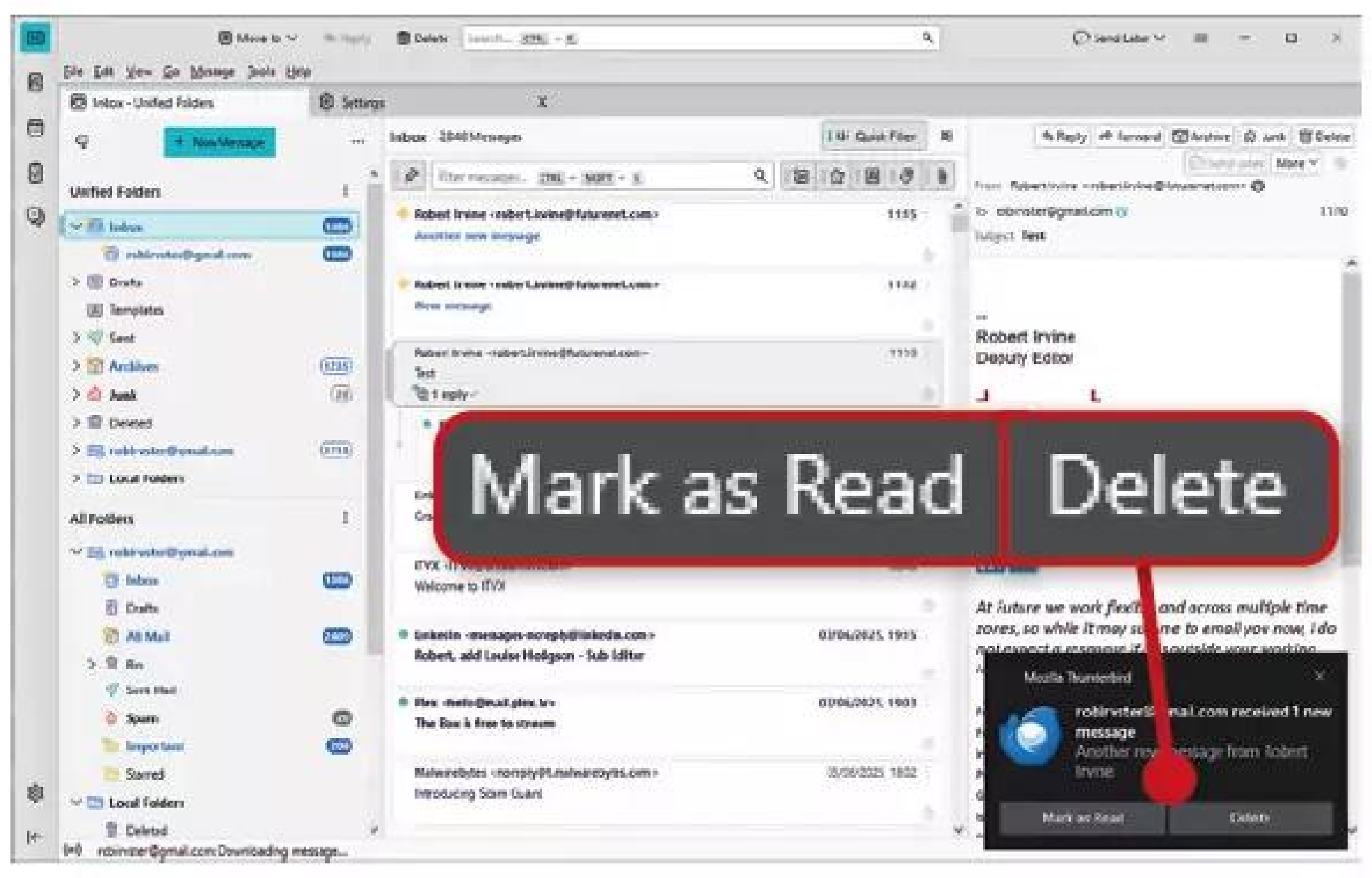
WEB www.ocenaudio.com **NEEDS** Windows 10 or 11, macOS or Linux

Ocenaudio is a simpler alternative to Audacity (**www.audacityteam.org/**) for editing your audio files. This update expands the number of supported audio formats, so it can potentially open obscure files other programs can't. It now lets you edit the metadata of multiple files at once, which is useful if they came from the same source. Press Ctrl+A to select all the items in the Opened Files panel, then click the Edit menu and choose Metadata twice (see screenshot). You can edit information such as the artist, album, year and artwork. The program's Sound Preferences and Add New Audio boxes have been redesigned, and a new option lets you edit the last effect you applied to an audio track. Ocenaudio triggers a SmartScreen warning when installing, but it's safe to use so just click 'More info' then 'Run anyway'.

EMAIL CLIENT

Thunderbird 139

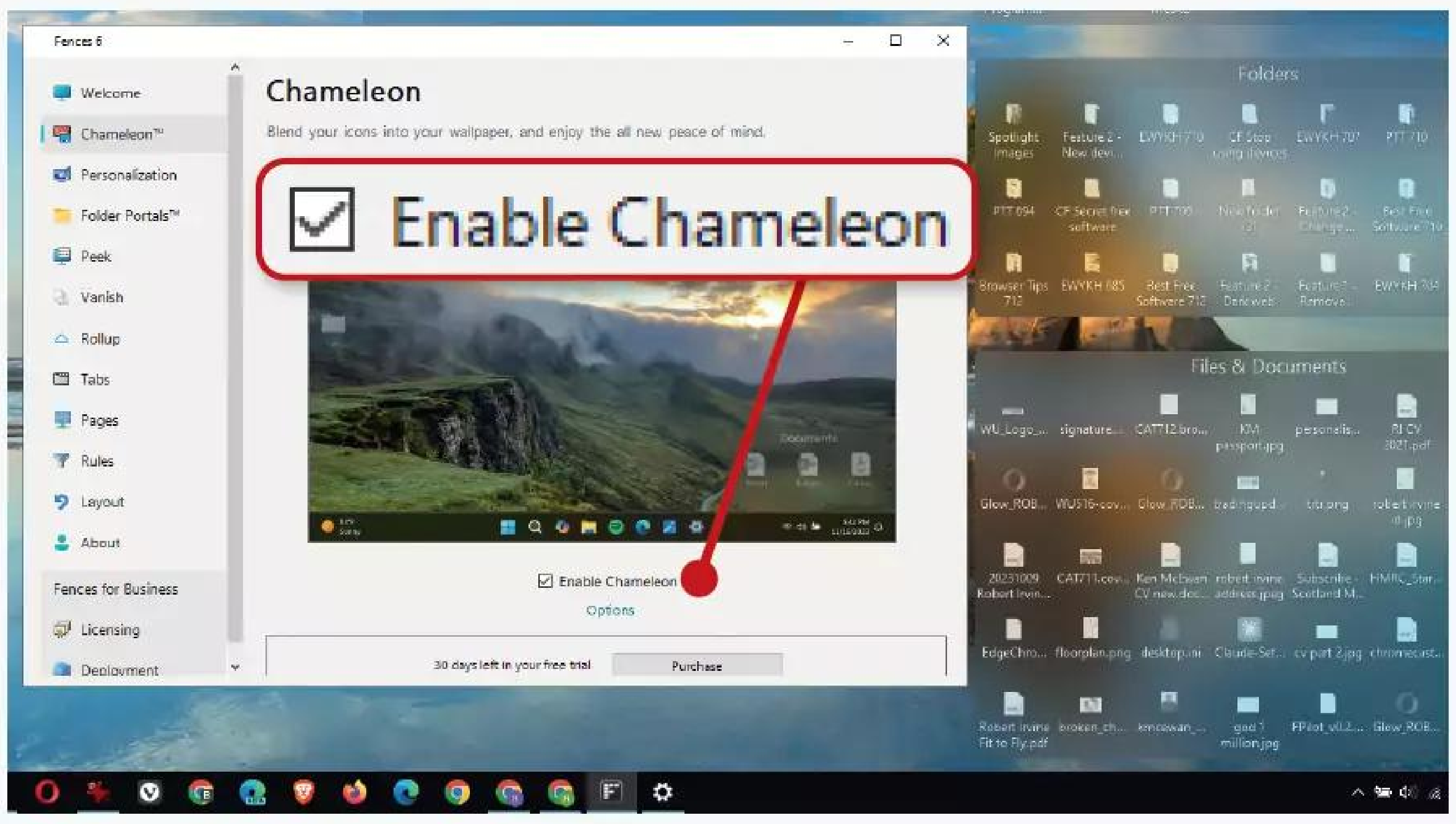
WEB www.thunderbird.net/en-US **NEEDS** Windows 10 or 11, macOS or Linux



With Microsoft's new Outlook app for Windows proving controversial, now is the perfect time to switch to Thunderbird. Mozilla's email client is fast, simple to use and free, and lets you easily manage multiple accounts. The latest version fixes dozens of bugs and makes several improvements to the interface. You can now manually sort folders in the Folders pane, so more important ones appear first. Simply drag and drop a folder into the desired position. Another new option lets you choose how many rows of a message are displayed in your inbox in Cards view (which shows responses in email discussion threads). Go to Settings, then Appearance and select either two or three rows. Best of all, when Thunderbird shows a new-message notification, you can now delete an unimportant email or mark it as read without opening it (see screenshot).

Should I pay for?

Choose the right version of software



Fences 6

WEB www.stardock.com/products/fences **PRICE** $18 per year
FREE TRIAL 30 days **NEEDS** Windows 10 or 11

If your desktop is cluttered with icons for files, folders and program shortcuts, Fences will help you keep it tidy. It works by arranging your desktop icons into themed groups called 'fences', which makes them easier to find than when they're in one random sprawl.

The default options are Programs, Folders and 'Files & Documents', but you can rename these and create your own fences by drawing rectangles on your desktop. The program lets you customise your fences to look and work exactly the way you want, including changing their background colour and opacity level, and rolling them up when not in use to free up screen space. We particularly like the Chameleon option, which fades all icons while keeping them visible (see screenshot), and Quick-hide, which hides (and reveals) everything on your desktop when you double-click a blank area.

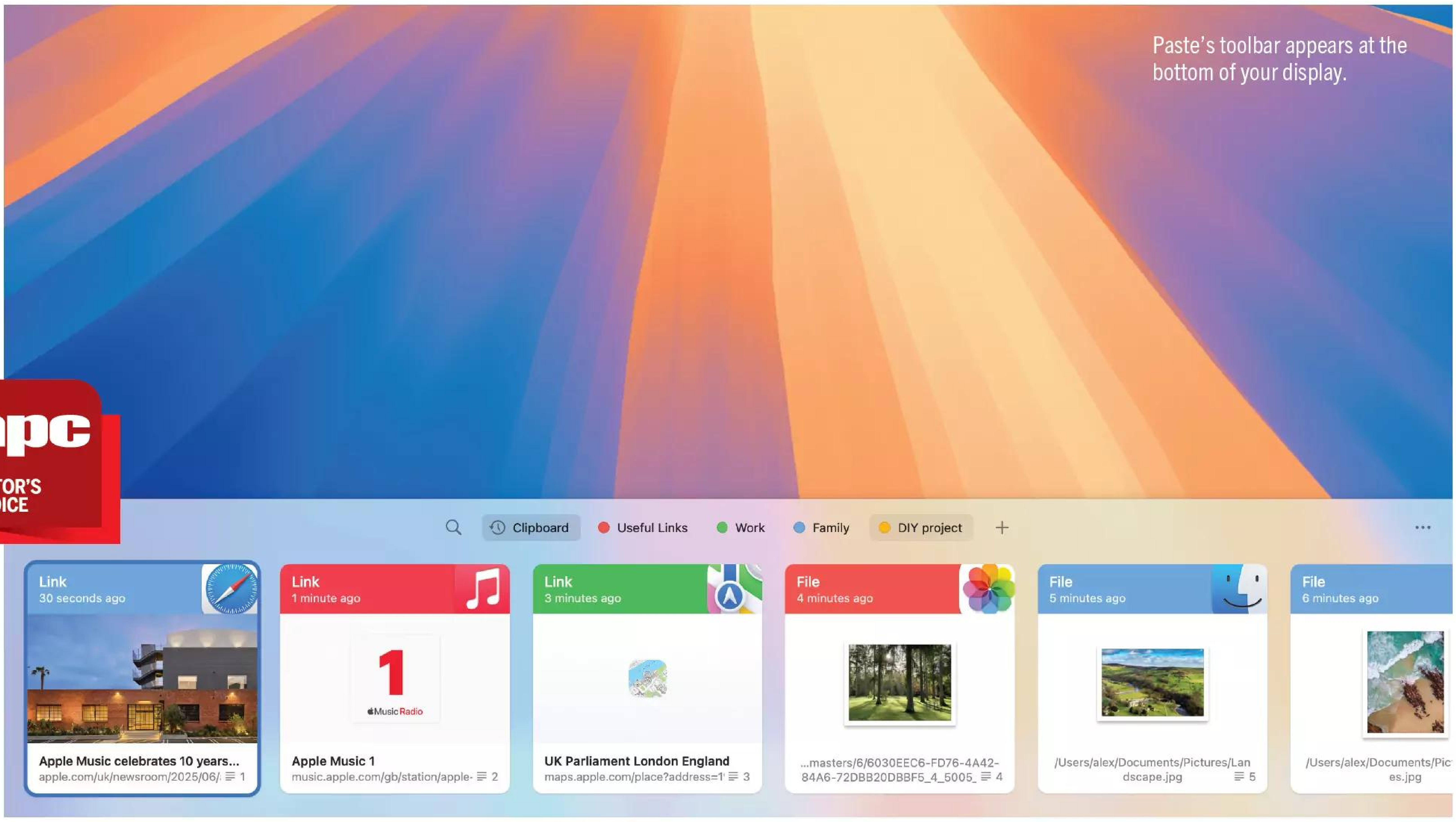
Fences 6 updates the Folder Portals feature, which turns folders into fences so you can access their contents with a single click. Moving Folder Portals on top of each other creates a tabbed view, and you can now copy files to a tab by dragging and dropping.

Another useful option takes daily snapshots of your desktop layout, so you can restore it if someone moves things around. You can also set up rules to automatically place items in specific fences based on their name, type or creation date.

OUR VERDICT: PAY FOR IT

Fences is a brilliant way to clean up your desktop, with lots of customisation options. The closest free alternative is Portals (portals-app.com), but Fences has loads more features, a smarter design and is easier to use. ■

> "We particularly like the Chameleon option, which fades all icons while keeping them visible, and Quick-hide, which hides (and reveals) everything on your desktop when you double-click a blank area."


Clipboard
Useful Links
Work
Family
DIY project
Link
30 seconds ago
Apple Music celebrates 10 years...
apple.com/uk/newsroom/2025/06/.
1
Link
1 minute ago
Music Radio
Apple Music 1
music.apple.com/gb/station/apple-
2
Link
3 minutes ago
UK Parliament London England
maps.apple.com/place?address=1
3
File
4 minutes ago
...masters/6/6030EEC6-FD76-4A42-84A6-72DBB20DBBF5_4_5005_
4
File
5 minutes ago
/Users/alex/Documents/Pictures/Landscape.jpg
5
File
6 minutes ago
/Users/alex/Documents/Pictures.jpg

Paste's toolbar appears at the bottom of your display.

PRICE Free (IAPs) **NEEDS** macOS 13 or later **WEB** pasteapp.io

Paste 5

The clipboard history champ with lots of potential uses.

While macOS Tahoe is bringing a clipboard manager to the table, Paste is all you need for your copying and pasting needs. It looks gorgeous, comes with powerful extras, and is full of smart features that make it seamless to use, including collaborative tools and Shortcuts integration.

Everything you copy on your Mac is added to Paste's clipboard log. When you press Cmd+Shift+V, Paste's toolbar pops up along the bottom of your screen – here, you'll see everything you've copied. It's then as simple as copying and pasting (or dragging and dropping) an item into your app of choice.

It's easy to browse through your clipboard history, and Paste's search functionality is activated simply by typing. You're meant to be able to filter by item type or the app the file was copied from, but that was hit and miss for us, with app names frequently not showing files we knew were in our clipboard history. Regular search worked fine, though.

There's more to Paste under the hood. You can create folder-like pinboards and sort items into them, and each board can be renamed and colour-coded. Individual items can be moved around as needed or renamed to make them easier to distinguish. The version 5 update brings shared pinboards, and each board has its own permissions settings, so you decide who has access. Paste's organisational abilities create some intriguing use cases. You might use it to store code snippets and then paste them into your work. Pinboards can be created to house colour hex codes for a design you're developing. Inspiring images can be stashed on boards for your latest DIY project. There's a lot of potential.

The app also comes with a Paste Stack, which is like a miniature clipboard manager. Press Cmd+Shift+C and a small box appears; everything you subsequently copy is added to it in order. When you go to paste, each item is taken from this stack in reverse order.

Unfortunately, the Paste Stack seems to work counterintuitively by default, as it pastes the most recently copied item first. If you copied things in order, you might want them to be pasted back in that order. You can change the paste sequence, but it feels like that shouldn't be necessary. As well as that, Paste Stack items are deleted as you use them, which is a bit annoying if you want to paste them into multiple apps.

Yet this is one of the few criticisms we have of Paste. It's a beautifully well thought-out app that's full of delightful touches and clever features. If you're even remotely interested in macOS Tahoe's clipboard history, chances are you'll love Paste even more. ■

> "It looks gorgeous, comes with powerful extras, and is full of smart features that make it seamless to use, including collaborative tools and Shortcuts integration."

VERDICT

★★★★★

Paste is the clipboard manager par excellence, despite Apple's best efforts in macOS Tahoe.

Alex Blake

PRICE US$9.99 (lifetime licence) **NEEDS** macOS 10.14.6 or later **WEB** Mac App Store

Fillably

Design and construct forms that work in Preview

Among Preview's virtues is its ability to fill PDF forms, with AutoFill to complete information drawn from your Contacts details. If you've ever tried using it for real, though, you'll have discovered it's far from perfect, skips some fields you need to use, and doesn't handle checkboxes well. Fillably is a lightweight app that does one thing better than any of the more general PDF editors: it helps you design and construct forms that work properly in Preview. Concentrating on this single function makes Fillably both quick and simple to use and powerful, as shown in its interactive tutorial that it opens the first time you run the app. This takes you through turning a tax statement into a fillable form, and shows off most of its features. It also serves as a reference as you progress to tackling your own forms.

Fillably supports text fields, checkboxes and radio buttons, each of which you drag out into a rectangle of the desired size. Several options accelerate this otherwise tedious process. Drag a side or corner of a box to resize it, move it one pixel at a time using arrow keys, or set the height or other dimension for a whole group of boxes at a time.

Text fields can be limited in the number of characters they accept, making it simple to create groups containing a series of single characters, a common requirement when entering dates and numbers of fixed format, such as social security numbers. Contents of text fields can also be aligned as appropriate, starting regular text at the left and setting numbers to the right, or settling in the centre.

Most PDF forms are designed with multiple entries of common size, and Fillably offers a convenient strategy for tackling those efficiently. Set the first up carefully so it's just the right dimensions, copy it, then paste that prototype into all the other similar entries. Drag each roughly into place before positioning them precisely with the arrow keys. The finishing touch is to align them uniformly using Fillably's menu commands, which offer alignment along any of the four edges, or vertical or horizontal centres.

In just a few minutes you can populate the busiest of forms spanning several pages. With all the boxes in place, finally set their tab order so you can flow smoothly through completion. Then save the PDF, and duplicate it ready to complete a copy of your master form in Preview. Fillably uses the Quartz PDF engine in macOS efficiently to write 'flattened', clean and concise PDFs. It has absolutely no vices, and should be your first choice whenever you need to complete a PDF form. It's the perfect companion to Preview. ■

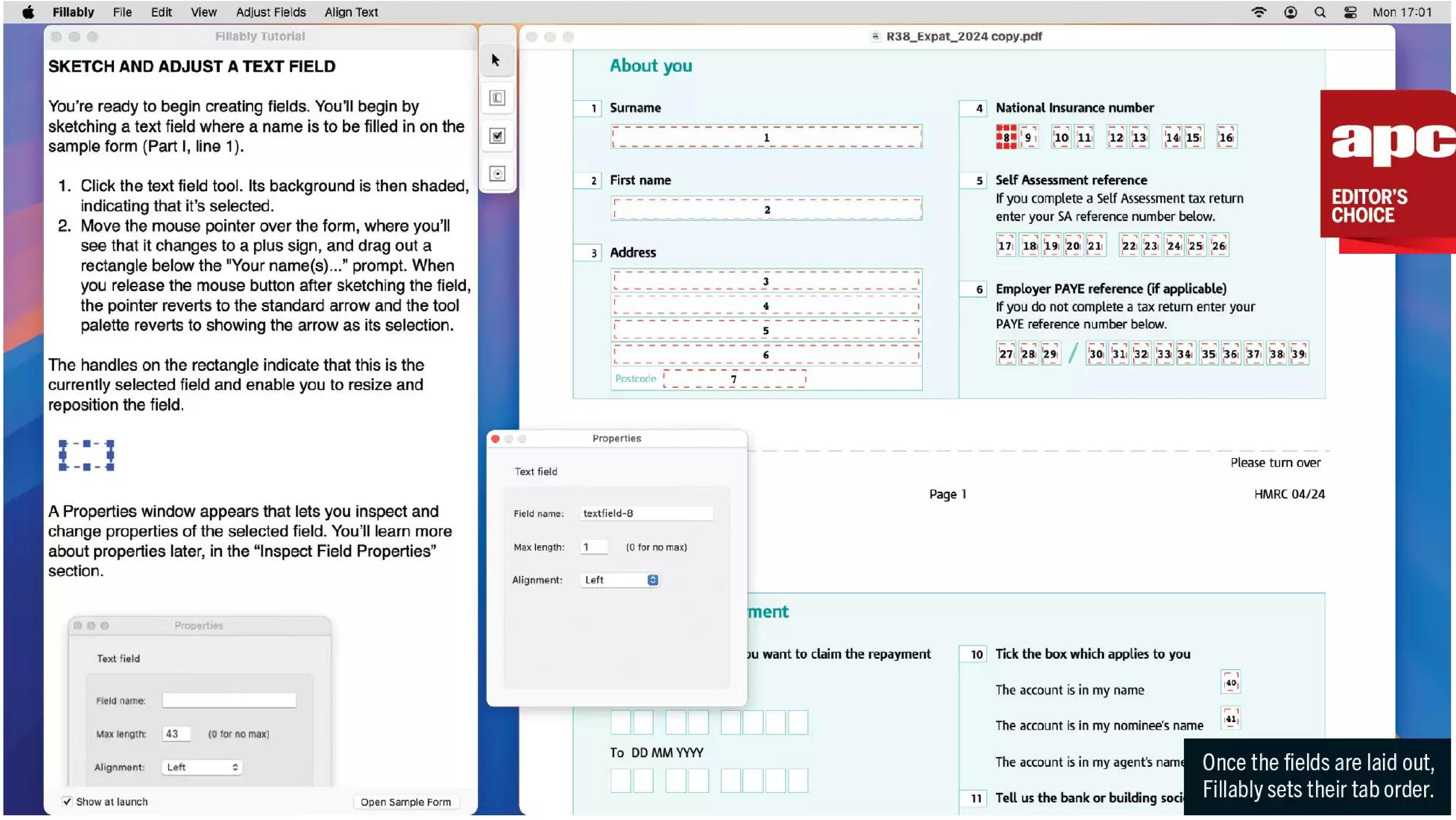
> "Concentrating on this single function makes Fillably both quick and simple to use and powerful."

VERDICT

★★★★★

The perfect suite of tools for swiftly creating better PDF forms for completion in Preview.

Howard Oakley



SKETCH AND ADJUST A TEXT FIELD

You're ready to begin creating fields. You'll begin by sketching a text field where a name is to be filled in on the sample form (Part I, line 1).

1. Click the text field tool. Its background is then shaded, indicating that it's selected.
2. Move the mouse pointer over the form, where you'll see that it changes to a plus sign, and drag out a rectangle below the "Your name(s)..." prompt. When you release the mouse button after sketching the field, the pointer reverts to the standard arrow and the tool palette reverts to showing the arrow as its selection.

The handles on the rectangle indicate that this is the currently selected field and enable you to resize and reposition the field.

A Properties window appears that lets you inspect and change properties of the selected field. You'll learn more about properties later, in the "Inspect Field Properties" section.

Properties
Text field
Field name:
Max length: 43 (0 for no max)
Alignment: Left

Properties
Text field
Field name: textfield-8
Max length: 1 (0 for no max)
Alignment: Left

About you

1 Surname
2 First name
3 Address
Postcode
4 National Insurance number
5 Self Assessment reference
If you complete a Self Assessment tax return enter your SA reference number below.
6 Employer PAYE reference (if applicable)
If you do not complete a tax return enter your PAYE reference number below.

Please turn over

Page 1

HMRC 04/24

ment
…u want to claim the repayment
To DD MM YYYY
10 Tick the box which applies to you
The account is in my name
The account is in my nominee's name
The account is in my agent's name
11 Tell us the bank or building soci…

Once the fields are laid out, Fillably sets their tab order.

WINDOWS 11
ALL YOUR QUESTIONS ANSWERED

The support deadline for Windows 10 is perilously close. **Lee Grant** explores your options if you're still clinging to a Windows 10 PC.

October will be here before you know it, and Microsoft will pull the plug on Windows 10 support. The great migration to Windows 11 will now have to begin and if you still haven't decided what to do, then (like a doctor with a concerned look on his face) I'm here to talk you through your options.

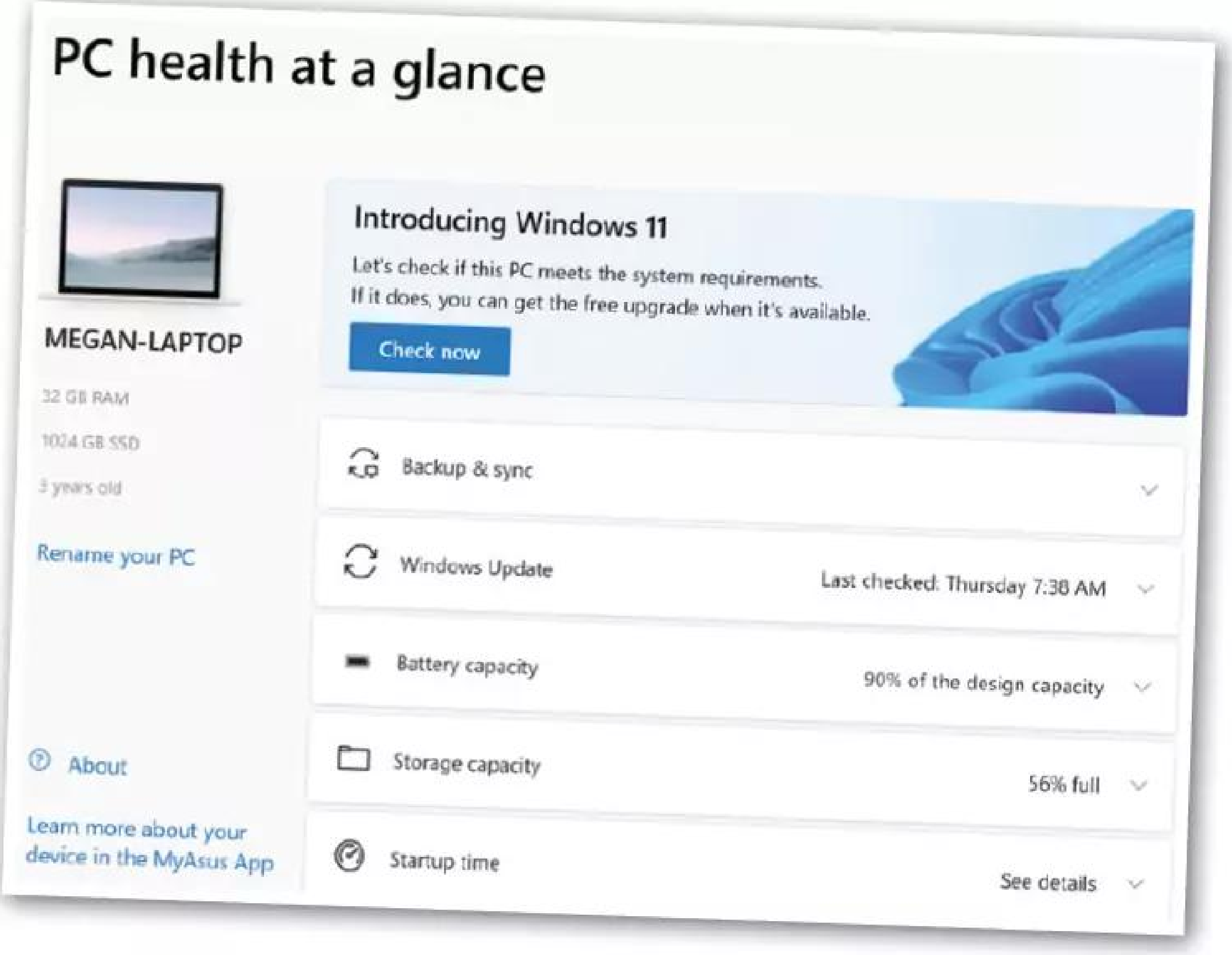
For the past year, barely a day has passed when I haven't had this complicated conversation with a customer, so *APC* has asked me to empty my brain and give you advice on what to do with your Windows 10 machine.

We'll look at your hardware, explain the upgrade options for AMD and Intel, for desktops and laptops, helping you to create a plan of action. Let's begin by working out exactly what you own.

Is my machine compatible with Windows 11?

The first thing to ascertain is whether your machine can jump from Windows 10 to Windows 11. Thankfully, Microsoft's PC Health Check (**tinyurl.com/APC550pchealth**) will scan a system and compare it to the Windows 11 system requirements before giving a yes or no verdict. If you get the green light, then Microsoft's glittering curtains will part and you'll be granted a VIP pass to Window 11's upgrade paradise, free of charge. If the vote didn't go your way, then don't panic because as good as it is usually, the Health Check is far from infallible.

The app can only make comparisons with the hardware currently inside your machine. It can't work out if a cheeky tweak or upgrade could nudge it over the line. In my experience I've found that this is especially true with AMD desktops.


PC health at a glance

Introducing Windows 11

Let's check if this PC meets the system requirements.
If it does, you can get the free upgrade when it's available.

MEGAN-LAPTOP
32 GB RAM
1024 GB SSD
3 years old

Windows Update: Last checked: Thursday 7:38 AM

Battery capacity: 90% of the design capacity

Storage capacity: 56% full

ABOVE Microsoft's PC Health Check will tell you if your system is compatible with Windows 11.

Can I upgrade an AMD desktop?

I've just worked on a 2019 desktop where its Ryzen 2700X CPU got the thumbs down from the PC Health Check. The machine's Gigabyte B450M DS3H motherboard, like most AM4 boards, accepts a broad range of AMD CPUs. The technology span of this model is six years, starting with 2018's dual-core Athlon 200GE, topping out with 2024's 16-core Ryzen 9 5950XT. Fitting a Ryzen 7 5800XT into this machine was a cost-effective upgrade, satisfying PC Health Check to allow the upgrade to Windows 11.

Fortunately for people seeking an AM4 CPU upgrade, 5th generation Ryzen chips remain in production. AMD conceived the AM4 socket to be flexible and upgradable. The ease with which a new AMD CPU could be dropped into a motherboard was a revelation to performance-hunting gamers, and the same versatility is sparing Windows 10 machines from the crusher.

PROCESSOR INCLUDES
AMD 3D V-CACHE™
TECHNOLOGY
AMD
RYZEN
5000 SERIES PROCESSOR
5

ABOVE Upgrading your AMD-based system with a new CPU may clear your path to Windows 11.

> THERE'S NO WAY TO SUGARCOAT THIS, BUT IF YOUR LAPTOP'S CPU DOESN'T MAKE THE GRADE, THEN THERE ISN'T MUCH YOU CAN DO ABOUT IT

ABOVE If your laptop doesn't make the grade, there's not much you can do about it.

AM4 handles three generations of Zen micro-architectures, and BIOS upgrades have made it possible to increment through them. The brilliance of AM4 is its versatility, so if PC Health Check gives your AMD desktop the red flag, then investigate the options for your motherboard.

Can I upgrade an Intel desktop?

If PC Health Check is whining about your Intel-based system, then you may have a problem. Whereas AMD has executed long-term desktop stability, Intel has changed direction more times than a man running from an alligator.

Intel launched the LGA 1151 socket, which supported 6th gen Skylake, 7th gen Kaby Lake, 8th gen Coffee Lake and 9th gen Coffee Lake Refresh, back in 2015. Although all these Lake variants would physically fit into the same socket, the chipsets that powered them were inflexible and there wasn't a BIOS solution to flip a motherboard between chipsets.

Windows 11 requires a minimum of 8th gen Intel (and a few Socket 2066 7th gens). If you have an Intel LGA 1151 desktop with 7th gen or lower, there's no upgrade path.

Irrespective of which platform you're running, don't despair if your machine won't pass Windows 11's hardware requirements. We have plenty of other suggestions for you, which we'll come to later in this feature.

What about laptops?

Ha, ha! You're funny.

No, seriously, what about laptops?

OK. There's no way to sugarcoat this, but if your laptop's CPU doesn't make the grade, then there isn't much you can do about it. The system-on-a-chip designs of modern laptop CPUs means that they're soldered to the motherboard. This innovation introduced slim laptops but it killed off CPU upgrades. Sadly, the non-upgradable architecture is also prevalent in many all-in-ones, small form factors and mini PCs. Most of these are essentially laptops in a different shaped box.

In more positive news, it's usually possible to upgrade the RAM and hard drive on a laptop, which is a good idea on a Windows 11 machine.

CLAIM AN EXTRA YEAR'S SUPPORT FOR FREE

The Windows 10 Extended Security Update program (ESU) should be available to most users by late August. The ESU runs from 15 October 2025 until 13 October 2026 keeping Windows 10 updated with security patches, but no new features.

There are three ways to enrol. The simplest is to pay Microsoft $30, but it's also possible to cash in 1,000 Microsoft Reward Points. You may have already earned these by searching via Bing on a PC or a mobile, via Xbox gaming rewards or from buying apps, movies and TV shows from the Microsoft Store.

The third method is more curious: Microsoft is giving the ESU to Windows Backup users for free. The app stores user settings, credentials, apps and folders safely in Microsoft OneDrive but, for the unaware, there's a trap. Windows Backup will, by default, try to move your Desktop, Documents and Pictures folder to OneDrive. That shouldn't be a problem for Windows 10 users already using OneDrive sync, but if your files are local and your Microsoft account has the standard 5GB storage, you're about to drown in "out of storage space" warnings as Windows Backup uploads your data.

The problem is worse for those running a Microsoft email account (Hotmail, Live, MSN, Outlook) because, since 2023, Microsoft has tallied email attachments against OneDrive storage. The moment OneDrive's storage limit is reached, users can no longer send or receive email. In other words, using Windows Backup to get a free ESU could kill your email. It is possible to turn off Windows Backup's default behaviour, but it returns on each launch. Be aware.

What should I do to prepare for Windows 11?

Once your machine meets Windows 11's requirements, look at what else will boost the performance. I hope it isn't too heretical to say that although Microsoft has done much to improve the performance of Windows 11, I've worked on machines where the innate sluggishness is reminiscent of its great-great-grandparent, Windows Vista.

As with Vista, the best remedy to Windows 11's performance woes is to upgrade the hardware, particularly hard drives and RAM. Despite the price of SSDs plummeting in recent years, there are plenty of Windows 10 installations chugging along on spinny drives. For these machines, the best bang-for-buck is a migration to SSD (see "Hard drive cloning", right).

A 2.5in SATA SSD is the simplest option, as it will slot straight onto the connectors, but if your motherboard has an unused M.2 slot (and many do), you can "jump the bus" by moving from a theoretical transfer speed of 600MB/sec to 4,000MB/sec for PCIe 3 and 8,000 MB/sec for PCIe 4. Check the documentation to see which flavour of M.2 is present, as there's a huge performance gain to be had. One potential problem with upgrading to Windows 11 from a machine that originally had a SATA drive is an incompatible partition type, but we have a fix for that (see "Changing the Partition: MBR to GPT" on the next page).

Although Windows 11 only requires 4GB of RAM, it will run like a Ferrari with a flat tyre on that quantity. Think about giving your machine more resources to work with and, if you're uncertain which RAM to purchase, seek your friendly neighbourhood computer store. Alternatively, retailers such as Crucial and Mr Memory have tools to help match memory to your machine.

HARD DRIVE CLONING

If upgrading your machine's hard drive is appealing, then the most convenient method is to clone it to a new drive. For this process, you may need hardware to connect an additional SATA or M.2 drive to your machine.

The magic part is handled by software that will ensure that the partition style, structure and data are replicated correctly. Some SSD manufacturers, such as Samsung or ADATA, supply software for the job, but many cheapskate value brands don't offer this to their customers.

Thankfully, you won't be short of "free" options, though many of these, by a staggering coincidence, restrict the ability to automatically clone from a larger drive to a smaller one, which commonly occurs these days when people clone a hard disk to an SSD. My tips are CloneZilla (enable the "-icds" and "Resize partition table proportionally" settings), DiskGenius or EaseUS Disk Copy Professional.

ABOVE Upgrading to an SSD is one of the most effective things you can do.

Why has my TPM not been detected by PC Health Check?

I'll bet that it hasn't been turned on. Until Windows 11 rocked up, few people outside of the business world gave a hoot about the Trusted Platform Module (TPM), so millions of machines left factories with it disabled. Switching it on is simply a case of heading into the BIOS/UEFI and finding the correct option.

This being the world of technology, different BIOS manufacturers put the software switch in different locations and often give it a misleading name. If you can't find it, then upgrade the BIOS (see your documentation) to the latest version and the TPM should spark into life.

Despite your best efforts, my desktop hardware remains incompatible. What can I do?

You're not alone. There are several hundred million machines out there that can't clear Windows 11's hardware high jump, but that doesn't automatically mean they'll be cast onto various e-waste mountains. Not yet, anyway.

Despite the annual headline declaring that the desktop is dead, I can assure you that isn't the case. They're certainly not as popular due to socioeconomic and convenience considerations, but for those who have an ATX desktop running Windows 10, there's no need to buy a whole new PC to run Windows 11.

Maximise the modularity of the platform by performing a selective hardware upgrade and swap out the CPU, motherboard and (possibly) the RAM. Size up your existing motherboard or case, to see which form factor you'll need. As someone who has accidentally ordered an ATX board for an M-ATX case more times than I'll admit, I know it's vital to get this right. If you're unsure, the motherboard manual will list the form factor and the case's documentation will highlight which form factors it can accept.

Another benefit of a selective upgrade is the opportunity to switch CPU teams. If you've been on Intel and fancy a bit of AMD, then now is the perfect opportunity. Ensure that your

DESPITE THE ANNUAL HEADLINE DECLARING THAT THE DESKTOP IS DEAD, I CAN ASSURE YOU THAT ISN'T THE CASE

ABOVE If you're not a keen gamer, you can probably get by with the graphics on a CPU.

board and chosen chip are compatible (see manufacturer's documentation or ask your vendor), then check if your new CPU comes with a cooler. If you wish to re-use an existing liquid loop, check it's compatible with the new chip, and if you're moving between Intel and AMD sockets, unearth the correct mounting brackets and bolts before you begin. If you're using a dedicated graphics card, a saving can be made by buying a CPU without a built-in GPU. Alternatively, if your dedicated graphics card is ageing, and particularly if you're not into games, then consider pulling the old GPU as the graphics technology aboard new generation CPUs will probably give better performance.

The only warning flag is RAM. AMD's AM5 socket uses DDR5, whereas Intel's LGA1700 boards can come in both DDR4 or DDR5 flavours. Again, match to what you already have or treat yourself to something newer.

To minimise the risk of buying incompatible parts then look for a pre-packaged component bundle from your local computer store or an online vendor such as CCL or Scan. If you're confident enough to purchase but less certain about changing the PC's engine yourself, then talk to your local, reputable, computer shop.

Won't Windows baulk at new hardware?

Changing the major components of your desktop will have implications for your existing Windows installation, and it's impossible to predict what will happen until the machine is fired up. Luckily, Windows 10 is exceedingly forgiving when it encounters new hardware and will likely whirr away merrily before normal service resumes. Remove all the old software drivers associated with the previous motherboard, CPU or GPU, then install the new stuff. Depending on how your machine was originally built, you may need to reactivate Windows 10. If you hit problems, you can always buy a new licence. Once the machine is activated, then the Windows 11 upgrade process can begin.

What can I do with an incompatible laptop?

As we've mentioned, laptops aren't designed to be upgradable (Framework being the notable exception), and because parts are bespoke for specific models, there's no interchangeability between machines. I can't install a motherboard from an HP ZBook Firefly into an Asus Zenbook because it physically won't fit. There's no ATX standardisation for laptop parts.

If at this point you've had enough and want to buy a new machine, then dispose of your old one responsibly (see "Reuse and recycle responsibly", opposite). If you're in the mood for rolling the dice, then I have more options for you.

Let's take a moment. The reason we're here is that Microsoft decreed that only certain bits of hardware could run Windows 11 and everyone else can do one. Well, guess what? They're not the police and Satya Nadella will not kick down your front door demanding to know why you haven't upgraded. It's your hardware and, as the kids say, "you do you".

There is the option to do nothing at all and remain on Windows 10. A point from history that Microsoft is conveniently ignoring is that when Windows Vista was on the chopping block, there wasn't a free upgrade path

CHANGING THE PARTITION: MBR TO GPT

One of the lesser-known requirements of Windows 11 is for the boot drive to have a GPT (GUID partition table) partition style. Most Windows 10 machines already have this, but not all, so let me show you how to fix it.

Warning: before you begin, work out which key combination your machine uses to get into the BIOS/UEFI. You'll need this during the process and it's better for your blood pressure to have this information now rather than not have it in about ten minutes.

Open Disk Management in Windows 10 and ignore the information in the top half of the box. Right-click on the "Disk 0" (or applicable), then select Properties. Select the Volumes tab and Partition Style should confirm you're running MBR.

Next, open a command window as Administrator and type "mbr2gpt /validate /allowFullOS" without the quotes. This will peek at your drive, perform a trial conversion, and flag any issues. Type "mbr2gpt /convert /allowfullOS". This time the command will, hopefully, complete without bother.

Restart the PC and enter the BIOS/UEFI using the key combination in our warning (you read that, right?). Once there, you need to enable UEFI booting mode by, most usually, disabling CMS or Legacy Boot mode. It will be there somewhere so look carefully. Once the change has been made, save, exit and you're golden. Re-check the Partition Style in Disk Management if you don't believe me. Windows 11 will now install.

REUSE AND RECYCLE RESPONSIBLY

Despite our best efforts, there may be some readers that opt for a new machine. If so, there's an opportunity for someone else to reuse it. Aside from local repair cafés, one resource is the TV & Computer Recycling Scheme (**recyclingnearyou.com.au/ewastescheme/**), which helps get hardware to new owners.

If you want to recycle the machine, don't launch it into your bin or general rubbish. The Scheme can find local drop-off points, but if you own a branded machine from a major tech manufacturer, contact them and find out where their take-back scheme collects from. In addition, all Good Guys stores are equipped to accept e-waste and batteries for recycling.

to Windows 7. The Vista to 7 migration was slow until Google stopped updating Chrome and, eventually, people shifted because they couldn't log into *FarmVille*. My point is that short of bricking machines, Microsoft has no influence over people who don't want to migrate and responsibility falls to other software companies. Firefox normally supports Windows for several years after the EOL date, and Norton only stopped supporting Windows XP in 2024. I fully expect to see Windows 10 machines in the workshop for the next few years.

If you fancy upgrading to Windows 11 without changing your hardware, then there's the option to run it on unsupported hardware. There are a few methods to achieve this, even without a full re-install, but one of the easiest methods is Flyby11 (**github.com/builtbybel/Flyby11**), which tweaks the Registry, downloads Windows 11 and begins the setup. I've been running an unsupported laptop for around a year with no problems, but there's uncertainty whether these machines will willingly upgrade to 25H2 or a full re-install will be required.

In order for such reckless and dissenting rhetoric to be written in this fine magazine, we've had to give our security expert, Lindsay Handmer, a brown paper bag to hyperventilate into. Therefore, *APC* would like to clarify that there could be potential security implications in continuing to run Windows 10 beyond the deadline. However, I've yet to see a machine virused to the eyeballs because of an unsupported OS and remind everyone that CrowdStrike ripped through Windows 11 security like norovirus on the QE2. #JustSayin'.

If you really need more time with Windows 10, then Microsoft offers its Extended Security Updates (ESU) program. For home users, US$30 buys you an additional 12 months of security support, but no new features. Or you can claim it for free, as we explain on p44. Businesses get up to three years of ESU, beginning at US$61, then doubling every year. Think of the ESU as give breathing room to individuals or businesses that are struggling to migrate.

For those running legacy apps that won't run on Windows 11, then virtualising your current Windows 10 environment to run under Windows 11 as a virtual machine may be the answer. However, be aware that our previous warnings about unsupported software definately also apply to VMs.

BELOW Bazzite is a gaming-focused Linux OS that can boost performance.

What about jumping ship to Linux?

October's deadline serves to remind us that Windows is not the only OS in town. There can't be many *APC* readers that haven't tried Linux over the years, and there are claims that in 2025 almost 1,000 variations exist.

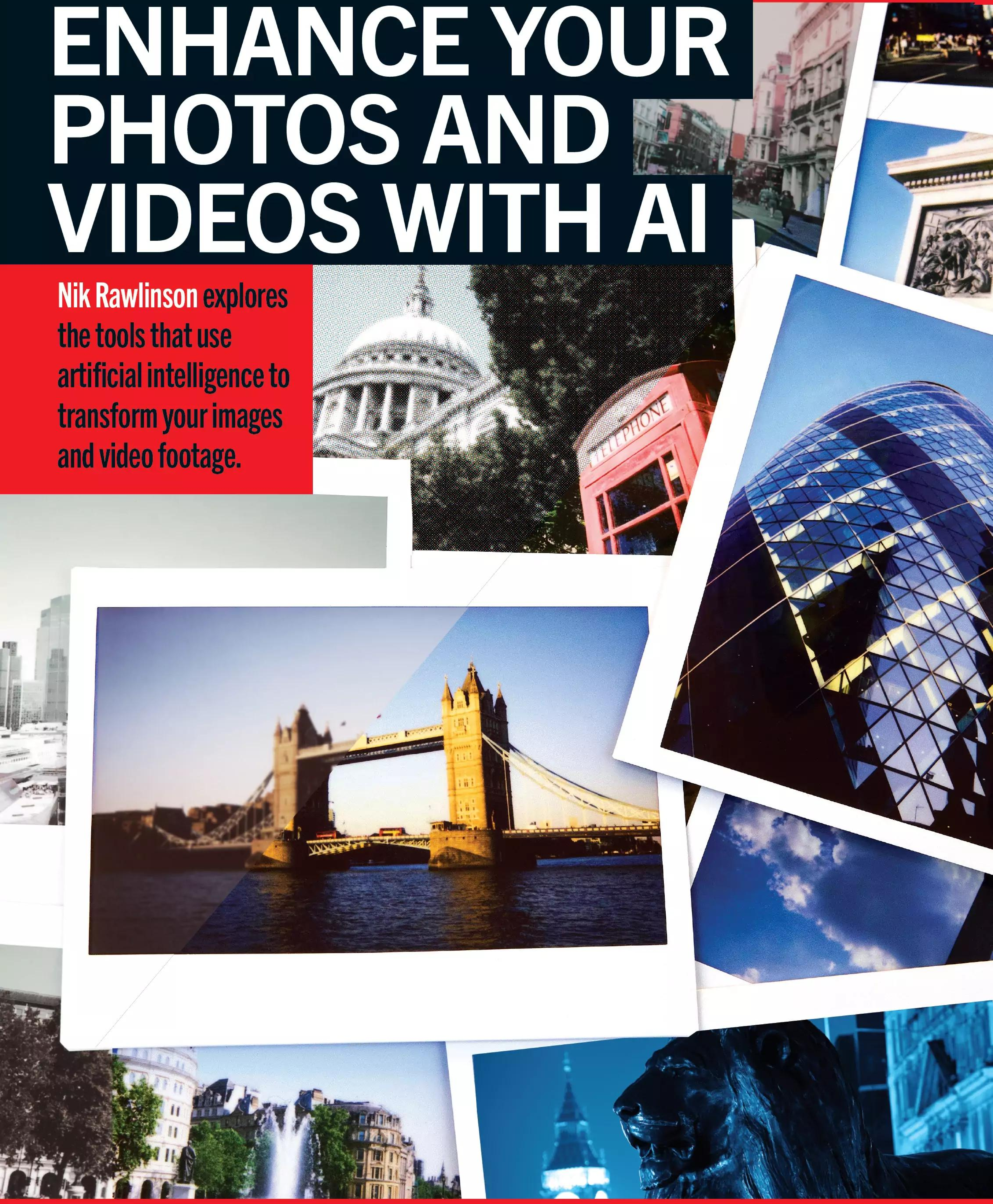
Luckily for you, Nik Rawlinson wrote a fabulous Linux rundown earlier in the year (see *APC* issue 546) packed with tips and distro advice. Alternatively, Endof10 (**endof10.org/places**) can locate an organisation nearby that will help you to migrate from Windows to Linux.

Two Windows alternatives that Nik didn't have room to mention are Bazzite, a gaming-focused Linux that has Steam pre-installed. If your Windows 10 gaming rig won't upgrade, then Bazzite will keep you playing and, so my customers report, can reduce hardware overheads and boost gaming performance.

My other recommendation is Chrome OS Flex, which is the nearest you can officially get to turning a Windows laptop into a Chromebook. It's free, fast, supported and a very pleasant user experience. The quid pro quo is that you can't download from the Google Play Store, but access to the Chrome Web Store works fine. It really is a great way to migrate into the Google ecosystem. ■

ENHANCE YOUR PHOTOS AND VIDEOS WITH AI

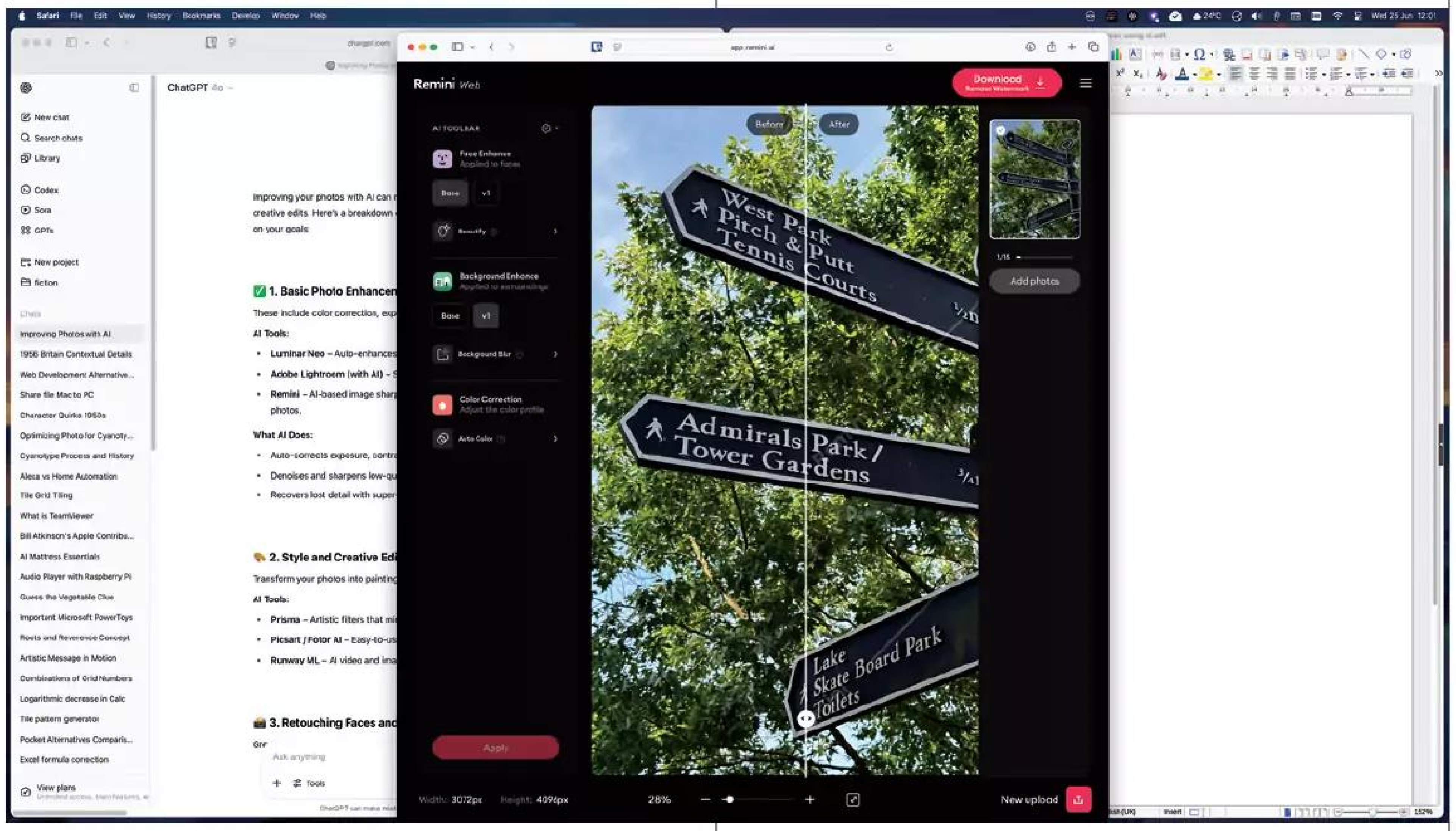
Nik Rawlinson explores the tools that use artificial intelligence to transform your images and video footage.



We all know that AI has an uncanny ability to generate text, graphics and videos from scratch. But it can also work wonders with your existing photos and videos, applying complicated adjustments and edits that would be tricky and time-consuming to accomplish by hand, and producing professional-quality results – most of the time, at least.

Since AI operations demand a lot of computing power, the best services for working with images and videos almost always cost money – but depending on your requirements there are often cheap and free options available. Here's a rundown of what you can do, along with our favourite tools for such jobs, whether you're working with stills or moving images.

The best services almost always cost money, but there are often cheap and free options available



LEFT Remini offers a wide range of AI-enhanced editing tools.

UPSCALE LOW-RESOLUTION PHOTOS AND VIDEO

Low-resolution images are a pain. They look cheap on the screen, and even worse when you try to print them out. AI engines can do a highly effective job of upscaling pictures – especially portraits – by filling in missing detail, based on what they've learnt from looking at millions of other similar images.

If you just want to upscale one or two images you can do it for free using ChatGPT (see the box on p51). For more control, or to batch-process a large number of images, you'll want a specialised AI service. Remini (remini.ai) is one that's designed specifically to enhance the detail and sharpness of low-resolution images. Its default settings double the resolution of your image in each direction, up to a maximum of 4,096 x 4,096 pixels –big enough to print an A3 poster at around 250 dots per inch (dpi).

You don't need any particular skills to get the most from Remini. Just upload your image and it will be immediately upscaled using the default settings. A split interface lets you zoom and pan around the image for a closer look, and you can drag a slider to compare the original image with the result.

Additional options, revealed by clicking the Background Blur and Beautify drop-downs, let you soften the surroundings or apply a range of facial enhancements. There's also a tone control, offering a selection of preset colour filters. Even better, it can also enhance video files of up to 240 seconds or 240MB for Personal users – or twice as long on a Business subscription.

Subscriptions are offered on weekly, monthly or annual terms, starting at US$6.99 a week for the Personal plan, which lets you upload 20 photos a week and download output in JPEG format. And to tempt you to try out the service, you can get your first week for just 29 cents.

RENDER LIKE A PRO

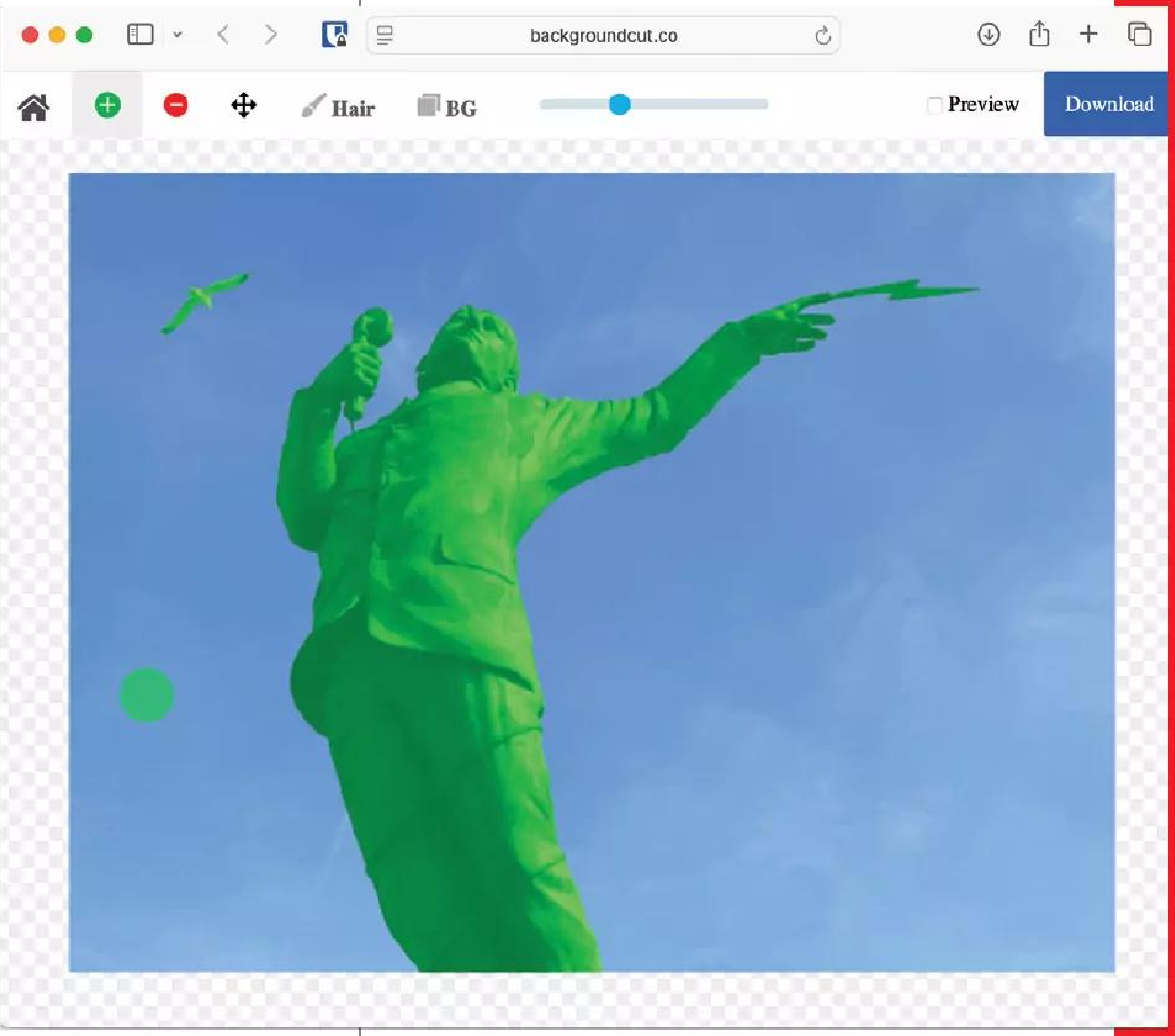
If it's mainly videos that you want to enhance, UpscaleVideo (**upscalevideo.ai**) is well worth a look. It can quadruple video resolution – so 1080p becomes 4K and 4K becomes 8K – as well as sharpening your footage, reducing noise and compression artefacts and even batch-processing assets using drag and drop. It's available for Windows 11 machines with Nvidia GPUs, and Macs running macOS X 14 or later on Apple silicon; a personal licence costs US$129, while commercial use costs US$30 per seat per month.

Another professional option is Topaz Labs' Video AI 7 (topaz.ai), which can upscale videos of any resolution to 4K. It now previews renders as they export, supports EXR files with enhanced colour support, and can run locally or in the cloud. It's not exactly a value option, however: Video AI 7 costs US$299 for a perpetual personal licence, and if you want to use it commercially you'll need to upgrade to Video AI Pro, which is available on a per seat, per year basis, at US$1,099 for individual users or from US$4,999 for teams of five. This also unlocks on-site multiple GPU rendering, so you don't need to share your footage with a third party for high-speed processing.

FILL THE GAPS

As well as extracting images from scenes, AI can add new content. Adobe Photoshop has long had an algorithmic Content-Aware Fill feature, but in recent years that's been joined by two new AI-powered capabilities called Generative Fill and Generative Expand. The former can be used to replace parts of an image with generated content, produced according to your direction and blended seamlessly into its surroundings. For example, if there's a car in the background of your family photo, you could use the marquee tool to select it, then tell Generative Fill to replace it with a bush or tree.

Generative Expand deals with the problem of photos that are cut off too tightly, or cropped to the wrong shape: it extends the image, using AI to generate realistic-looking details beyond the existing canvas. To use it,



BELOW BackgroundCut does just what its name suggests.

select the crop tool and use the grab handles to drag out, rather than in, from the existing edge of the frame. The default behaviour will analyse the existing content and automatically produce new content to match – or, you can type a prompt to guide the generation process if you need greater control over what it produces.

Similarly, you can use AI to produce video content to pad out your existing footage. Google Gemini Veo 3 (**deepmind.google/models/veo**) is one of the most engaging recent arrivals: it's designed for producing eight-second videos, again based on text prompts, which makes it an interesting option for generating B-roll content for context or quick cut-aways. Such content is particularly useful when you want to disguise any edit that would otherwise result in a jump-cut.

You can use it in either Gemini or Flow, but note that it isn't included in the free tier – at a minimum, you must be on the Google AI Pro plan at US$32.99 a month (although it's free in your first month if you want to give it a try).

EXTRACT OBJECTS FROM THEIR BACKGROUNDS

Another job for which AI is perfect is extracting images from their backgrounds, giving you a clean cutout. Again, if you just need to produce the occasional edit, ChatGPT can help, as we discuss opposite. For a more flexible approach, BackgroundCut (**backgroundcut.co**) is a tool that's specifically designed to identify the primary subject of your photo and extract it from its surroundings. We've found it impressively quick and accurate when working with photos of people, and you can use it for free if you only want to download images of 0.5 megapixels and smaller, while paying customers can download high-resolution extractions of up to 12 megapixels.

Once you've uploaded your image, BackgroundCut performs a first pass and presents a preview of the result. We've found it's usually very accurate right off the bat, but if need be you can manually refine the selection, using green and red brushes to mark areas that should be kept or removed. Your results can then be downloaded in PNG format, with transparent backgrounds.

Pricing is refreshingly simple, at $9 per month for unlimited single-image processing. For bulk processing you'll need to buy credits, costing US$10 for 500 images, but be aware that these expire if not used within 60 days. You can also spend credits to use the API, which allows BackgroundCut to integrate with other tools such as Figma and WooCommerce, and there's a Chrome Extension in the works.

Manually typing and placing subtitles is a drag, but this is another area in which AI can help

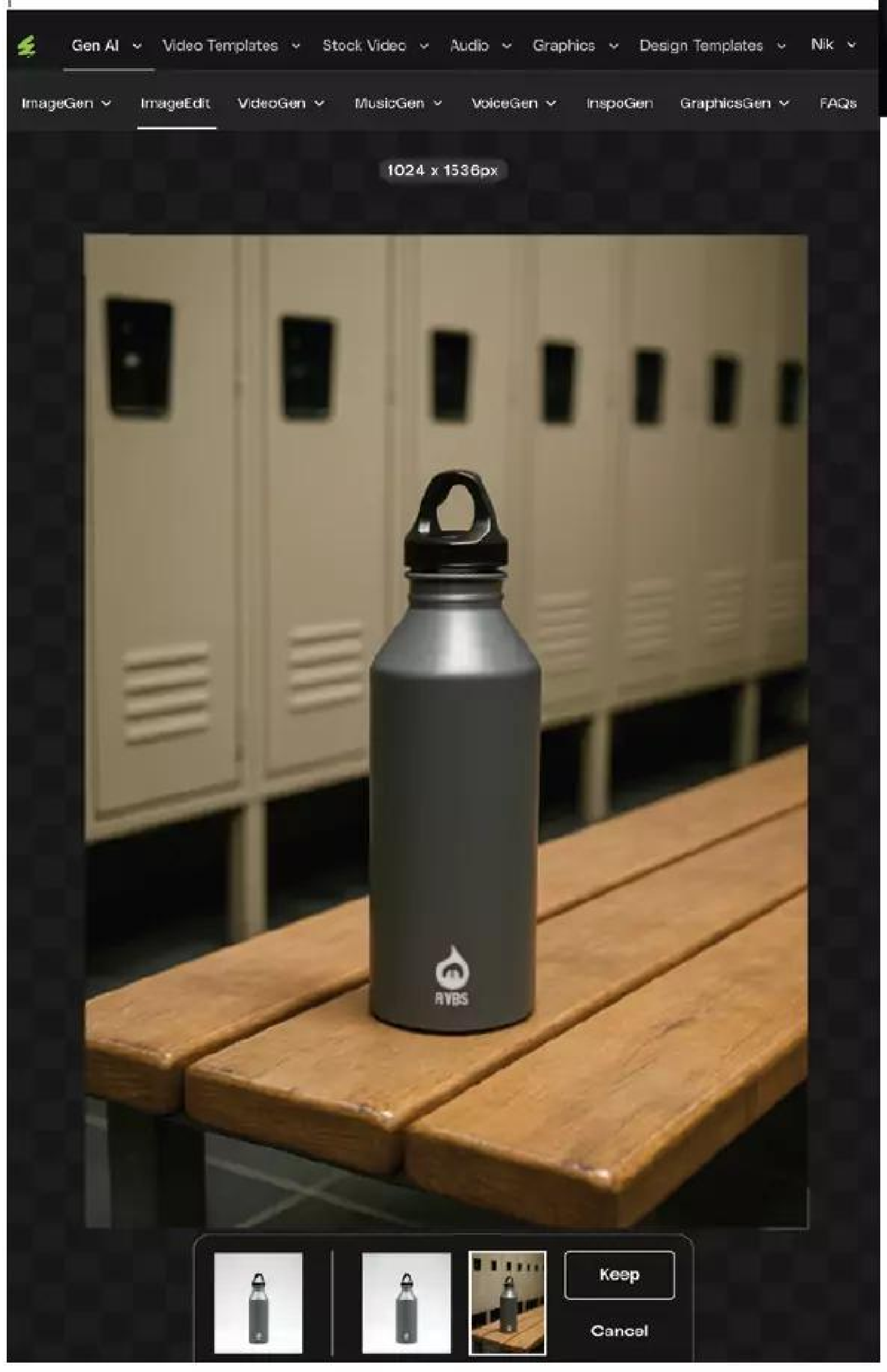
ADD AN IMAGE BACKGROUND

We've seen how AI can remove the background from an image; Envato's ImageEdit tool (labs.envato.com) goes the other way, creating a whole new replacement background for your picture.

We tried it with a photo of an insulated sports bottle from stock photography site Unsplash (**unsplash.com**); you can see the original photo in the thumbnail strip at the bottom of the screenshot below. Once ImageEdit had ingested the photo, we clicked Replace in the sidebar and entered the prompt "replace the background with a bench in a gym locker room so the bottle is sitting on the bench".

ImageEdit examined the image and within 30 seconds had finished interpreting our prompt. The result was the bottle on a bench you can see in the screenshot below, complete with arty shallow depth of field.

ImageEdit can be accessed as part of an annual subscription to Envato Elements. For individual users, this costs US$16.50 a month and includes unlimited downloads from Envato's library of more than 22 million assets and templates, as well as AI-enhanced image, video and audio editing with a lifetime commercial licence for assets.



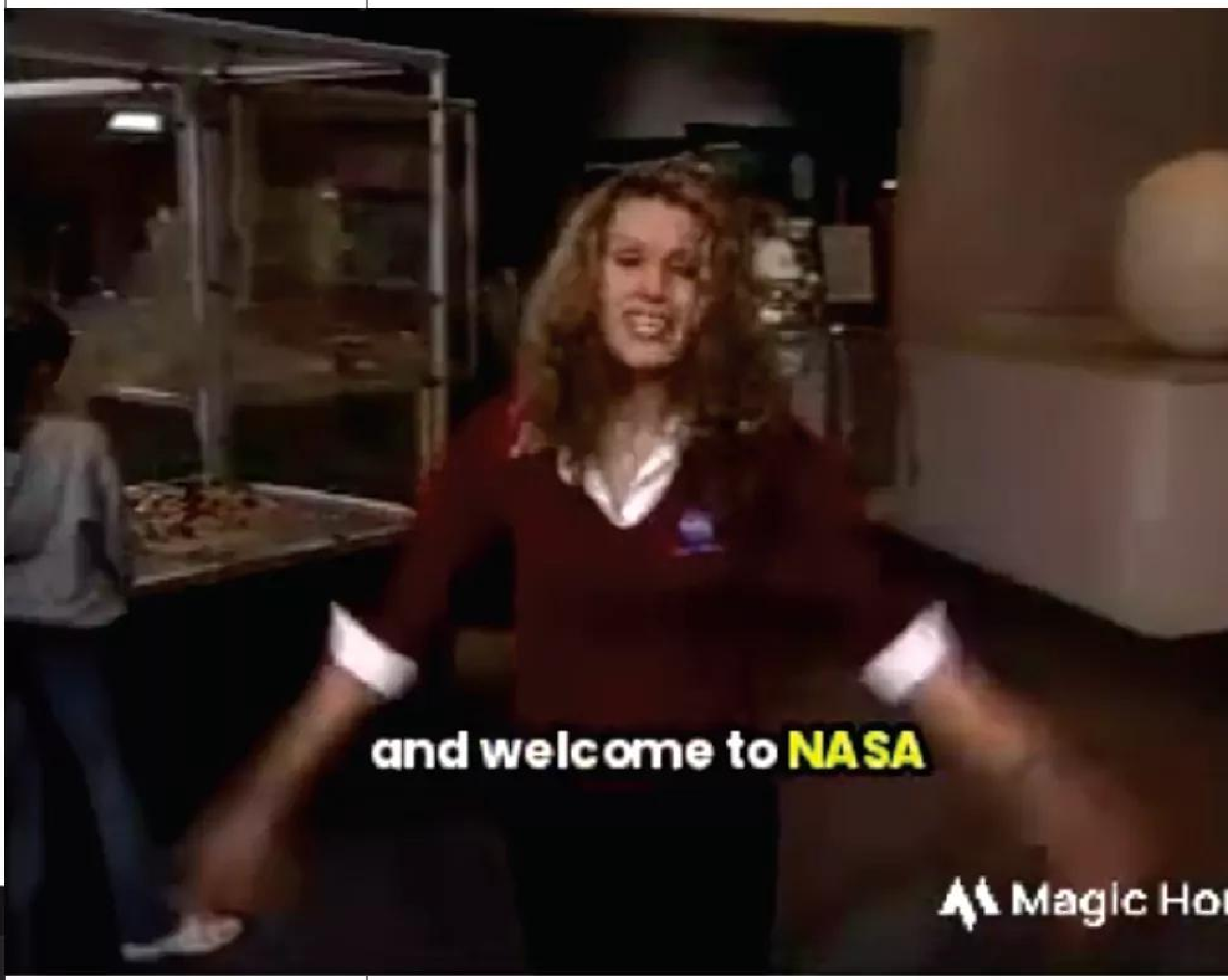
LEFT The bench and lockers in this photo are entirely AI generated.

ADD SUBTITLES TO YOUR VIDEO

Video subtitles are a must for accessibility, and they can also increase engagement. For example, fast food giants A&W Canada found that adding captions to a video story on social media "increased watch time by 25%".

Manually typing and placing subtitles is a drag, but this is another area in which AI can help. If you're comfortable with the command line, you can use OpenAI's Whisper tool to automatically generate subtitles for free from all the most common audio and video file types. You can download the unofficial Windows installer from **github.com/Purfview/whisper-standalone-win**.

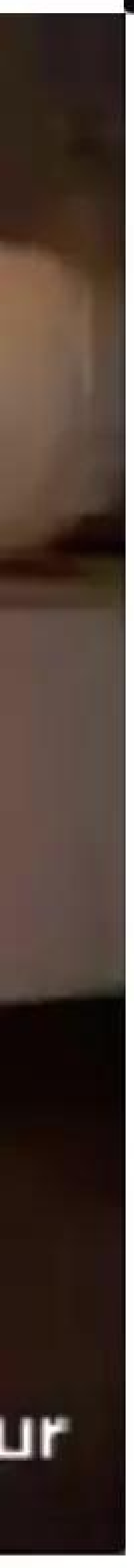
BELOW We used the karaoke style to add subtitles to this archive video from NASA .



If you prefer not to use the command line, another option is to try YouTube's auto-captioning service. Just upload your video – setting it to private or unlisted if you don't want it to be generally available – and let the site automatically generate subtitles for it. Once it's done, open the video and click "...more" in the description panel. Click "Show transcript" and then "Toggle timestamps"; you can now copy and paste the generated subtitles to anywhere you like.

For a professional solution, Magic Hour (**magichour.ai**) has a wide range of AI image- and video-editing capabilities, including creating videos from prompts, inserting new faces into existing footage and, yes, generating subtitles. It offers four subtitle styles, including a no-nonsense minimalist text-on-screen option and an engaging karaoke style, in which each word turns yellow as it's spoken on the soundtrack. We found the results to be highly accurate with our test videos.

You can trial Magic Hour for free on any video of less than 50MB; the output will have a watermark, and will be limited in resolution, but you'll get a good idea of how the tool works. Paid plans start at $15 a month, or $180 annually. Note that the yearly plan lets you generate around an hour of subtitled output a month, while on the monthly plan this drops to seven minutes. Beyond this, pro and business plans increase the resolution and total amount of footage you can play with.



KEEP THINGS PRIVATE... WITHOUT KEYFRAMES

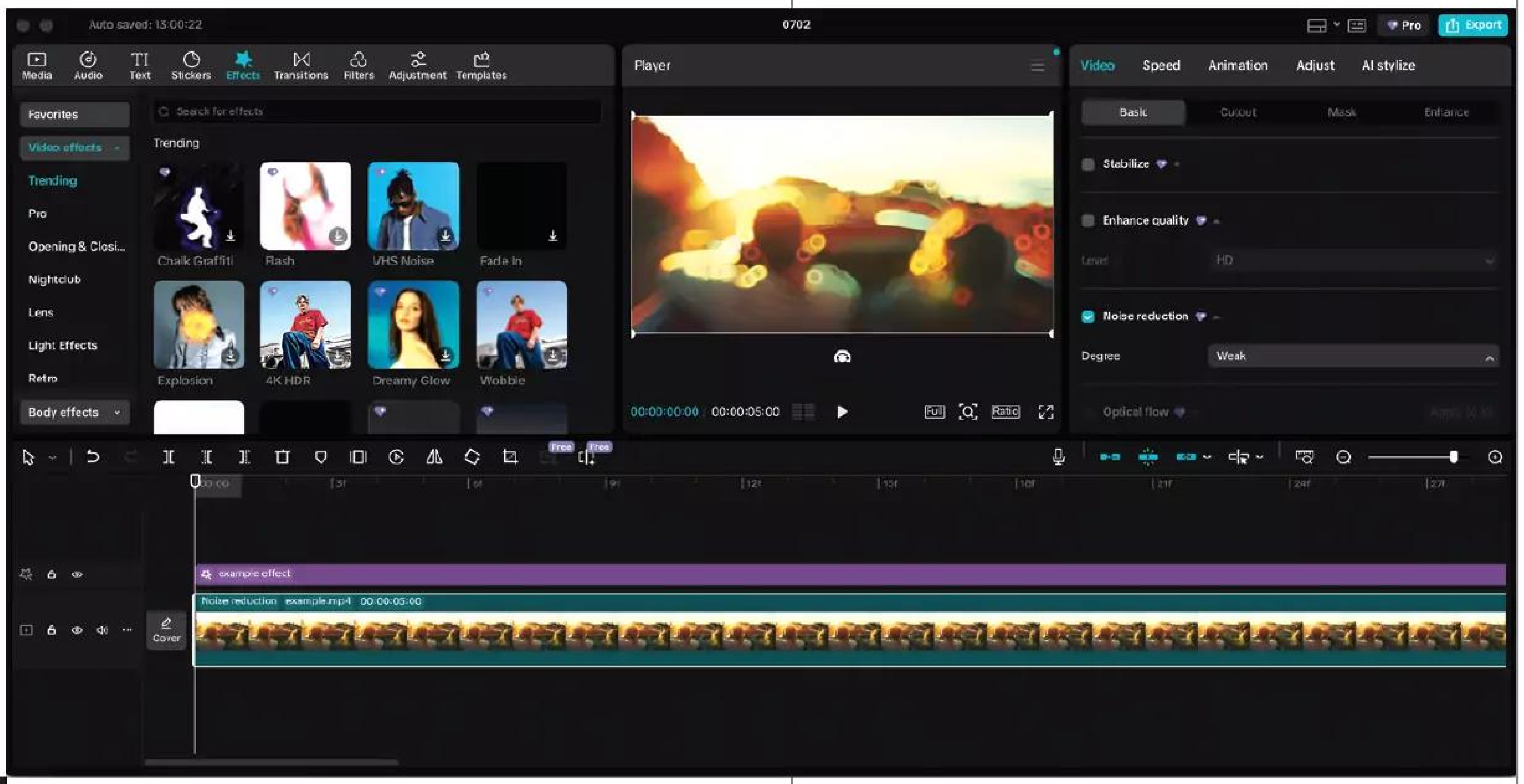
Sometimes you need to obscure elements in a video, such as someone's face or a car number plate. Traditionally, you'd handle this by applying a blurring effect to a specific region of the frame, and then moving it around to follow the underlying people or cars.

This can be tricky and tiresome, and it's another task where AI can help. The aptly named Video Blur AI (**blurvideo.ai**) service promises automatic recognition and tracking of both faces and licence plates, so you can blur every identifiable element in a busy scene without having to manually process each one.

If you prefer, you can be more selective: for example, you might only need to blur minors, or people who haven't given specific permission for their likeness to be included. Once Photo Blur has recognised all the faces in your footage, it will assign each one a number, after which you can specify which particular faces you want to obscure, and leave the rest in clear view.

SHARPEN UP SUB-STANDARD FOOTAGE

While low-quality photography can sometimes be passed off as a deliberate, artistic choice, it's hard to get away with that in video. Noisy footage is usually a distraction, and unpleasant to watch for extended periods. If you can't re-shoot your raw material, AI can help clean it up.


Auto saved: 13:06:22
0702
Export
Media
Audio
Text
Stickers
Effects
Transitions
Filters
Adjustment
Templates
Favorites
Video effects
Trending
Pro
Opening & Closi...
Nightclub
Lens
Light effects
Retro
Body effects
Search for effects
Chalk Graffiti
Flash
VHS Noise
Fade In
Explosion
4K HDR
Dreamy Glow
Visible
Player
00:00:00:08
00:00:05:00
Video
Speed
Animation
Adjust
AI stylize
Basic
Cutout
Mask
Enhance
Stabilize
Enhance quality
Noise reduction
Degree
Weak
Optical flow
example effect
Noise reduction example.mp4 00:00:05:00
Cover

ABOVE **CapCut's built-in noise-reduction tool allows you to clean up low-quality raw video material.**

The free app-based version of CapCut (capcut.com) includes a built-in AI noise-reduction tool. In order to use it, first import your material, then drag it onto the timeline and select it. It will show with a white border to indicate that it's active; now click Video at the top-right of the adjustments panel, make sure that Basic is selected on the row below, then scroll down to "Noise reduction". Tick the box beside the heading, then select either Weak or Strong from the drop-down menu to determine the strength of the correction applied.

You'll notice that there's a diamond icon beside this feature, indicating that it's a pro-level function. Although you can see what effect the option has when you play back your edited video, you'll need to upgrade to continue using the tool in the long term. At the time of writing, this costs US$9.99 a month or US$90 a year.

As well as unlocking noise reduction, a CapCut subscription gets you several other AI tools, including relighting, expanding the video frame, lip sync and reframing. Some of these tools need permission to upload your media to CapCut's servers, which might be a privacy concern – but that's par for the course considering the computing power required for this type of function. ■

AI image editing for free with ChatGPT

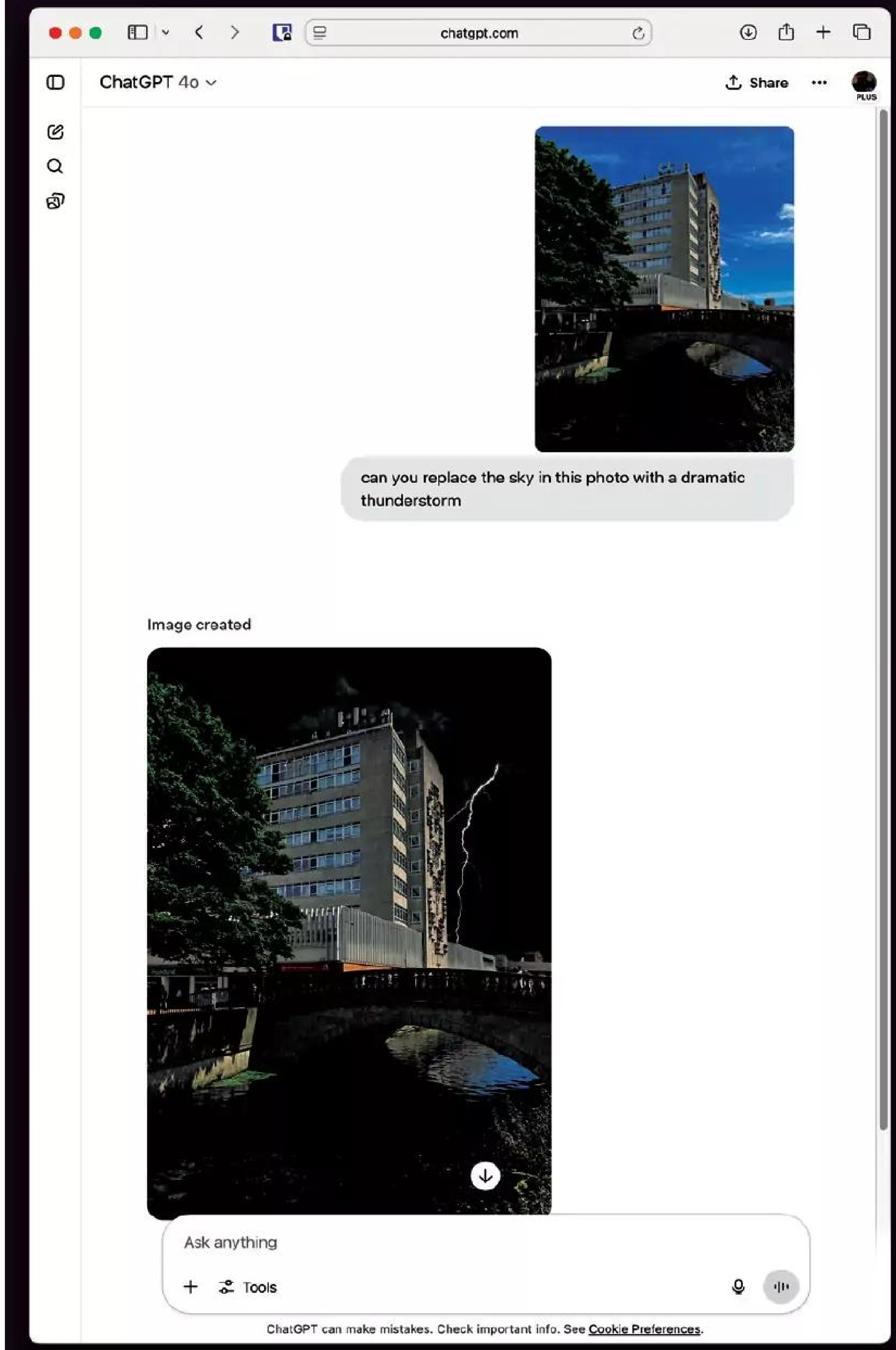
If you don't want to invest in a specialist AI-powered editing service, ChatGPT can do a surprisingly good job with images, even for free users. For example, you can upload a photo and ask the engine to resize it to your desired dimensions for an AI-upscaled version. The results might look a little airbrushed, but generally it's a lot better than just blowing up your low-resolution original.

It can handle more advanced operations, too. We asked ChatGPT to replace the blue sky in an uploaded image with a thunderstorm (see below) – and the 4o model did a fairly good job. It wasn't perfect: it didn't change the blue sky reflected in the river or correct the lighting on the building, but it's a good start. You might be able to improve things by refining the prompt.

We also asked ChatGPT to cut out the building from its background, which it managed with an impressive level of accuracy. We were then able to download the result as a PNG with a transparent background.

There are, however, two potential issues with using ChatGPT for image processing. One is that it lacks options for precisely tweaking and adjusting the results, unlike most dedicated tools. The other is that it comes with various practical limitations. Uploaded images must be 20MB or smaller, and if you're an individual user there's also an overall usage cap of 10GB, which rises to 100GB for organisations.

Free users can typically upload three images every 24 hours when using GPT-4o, although the exact number depends on load and recent rate-limit updates. Paid plans are limited to uploading 80 files in any three-hour period. You'll find further details on upload and usage limits at tinyurl.com/APC550chatlimits.


chatgpt.com
ChatGPT 4o
Share
Tools

can you replace the sky in this photo with a dramatic thunderstorm

Image created

Ask anything

ChatGPT can make mistakes. Check important info. See Cookie Preferences.

KEEP YOUR COOL

IF YOU WANT A FAST, RELIABLE COMPUTER, HEAT IS THE ENEMY. DARIEN GRAHAM-SMITH EXPLORES WHY THERMAL MANAGEMENT IS SO IMPORTANT, AND HOW TO KEEP YOUR OWN PROCESSOR RUNNING COOL.

The CPU in your phone, tablet or computer processes billions of operations a second. On the microscopic scale, that means opening and closing billions of tiny electrical gates. This is done using electrical energy – and, as you may recall from physics class, no electrical process is 100% efficient. Every time a transistor is activated, a small amount of energy is lost as heat.

Is this a big deal? In isolation, no. The heat generated by the operation of a single transistor is minuscule. No chip manufacturer publishes this figure; we suspect it would be difficult to even estimate on such a tiny scale.

However, with billions of operations per second going on across billions of transistors, the heat can quickly build up, causing a significant proportion of the chip's area to become measurably hotter. In fact, that's an understatement: without some sort of thermal management, the internal temperature inside a typical desktop CPU would easily go well beyond 100°C in everyday use.

Exactly how much heat a chip will generate – and how quickly – depends on a variety of factors. One is exactly how fast it's running, as running more operations per second naturally leads to a quicker build-up of heat. This is why overclocking is considered a risky business, and why enthusiasts often invest in souped-up coolers, as we'll discuss below.

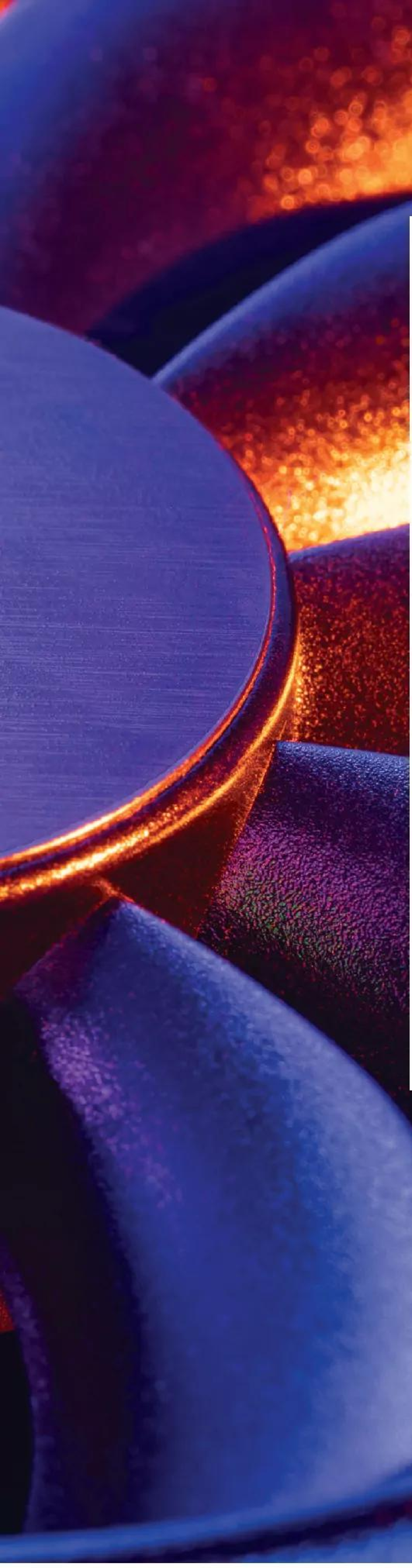
The complexity of the task is a factor, too. Chunky workloads such as video editing and AI processing can light up dozens of cores at once, while many programs run largely on a single CPU core – meaning a large portion of the chip is left sitting idle, and cool. In fact, modern chip designers aim to completely power down unused chip areas whenever they're not in use, partly to reduce power consumption but also to minimise heat buildup.

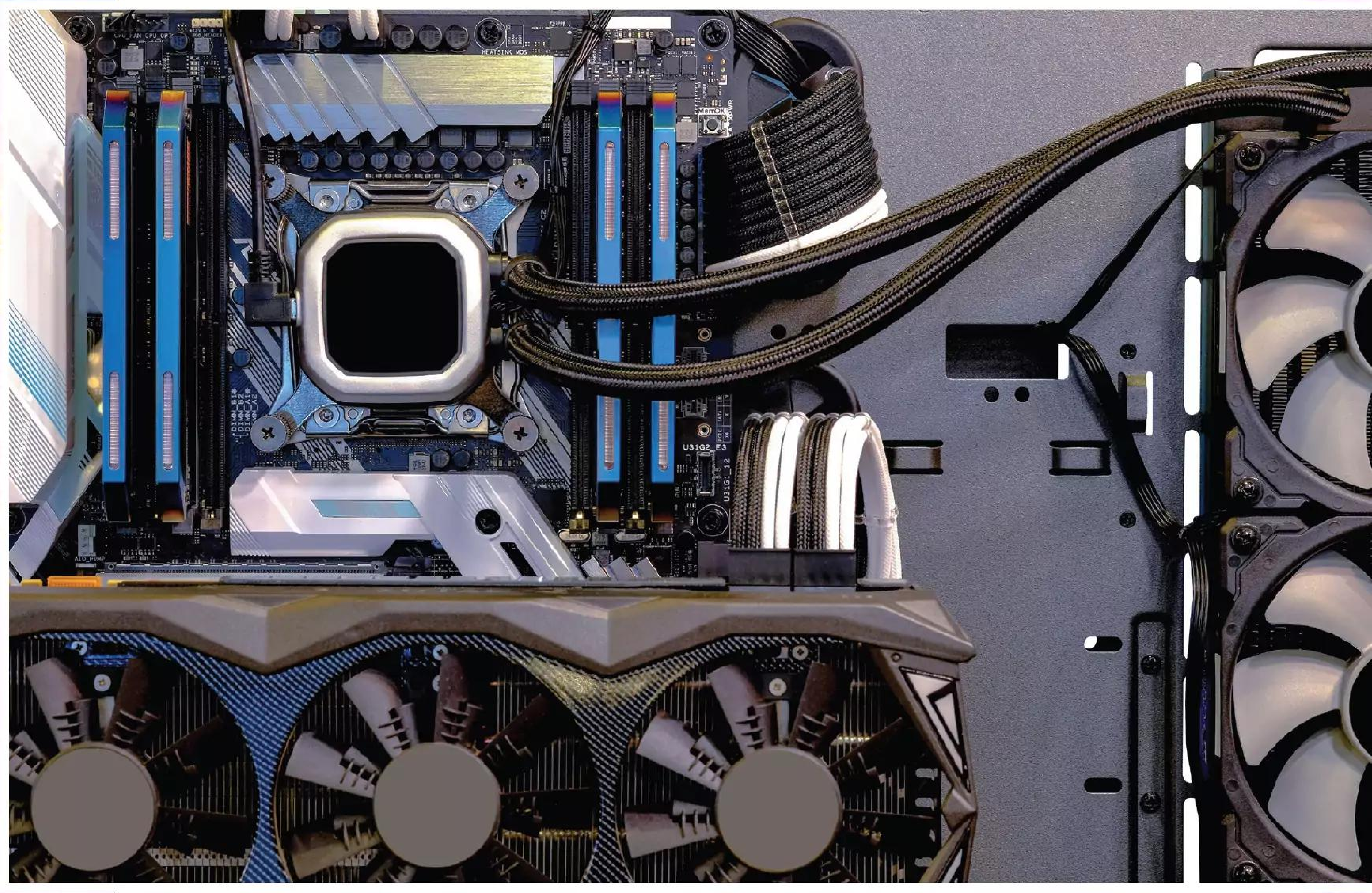
This brings us to the final factor: the physical make-up of the chip itself. All things being equal, a chip with a billion transistors will generate more heat under load than a simpler design. Hence, chips intended for thin and light laptops, which have limited cooling capabilities, tend to use simpler designs with fewer cores. Desktop processors can afford to pack in more silicon, while server hardware typically uses large complex chips with high core counts and fast clock speeds, relying on high-powered external cooling systems to prevent overheating.

THERMAL THROTTLING ISN'T AS BAD AS A CPU CRASH, BUT HAVING YOUR WHOLE SYSTEM SLOW DOWN ISN'T GREAT

THE DANGERS OF OVERHEATING

So why do we care if a CPU gets hot? To an extent, we don't. Chips are designed to run indefinitely at temperatures up to around 90°C or 100°C, depending on the model. But if the inside of the processor gets hotter than that, the transistors





ABOVE **Liquid-cooling assemblies help draw the heat well away from the motherboard to a separate cooler unit.**

inside it may start to malfunction. As the heat increases, the silicon material gets increasingly conductive, to the point where electrons can start to leak through gates that are supposed to be closed. There's really no way to work around this sort of fundamental operating error: the inevitable outcome is program glitches, quickly followed by a complete system crash.

If you make a regular habit of running a chip at unstable temperatures, the consequences can be even worse. A phenomenon known as electromigration occurs at high temperatures, causing the transistors to become deformed. This results in a chip that's permanently unstable and unreliable, even at room temperature.

To safeguard against these scenarios, all modern processors manage their own internal temperatures using a technique called thermal throttling. This simply means that if a chip detects that it's getting too hot it will automatically dial down its own operating speed until the temperature returns to an acceptable level. The same principle is applied in reverse to apply short bursts of "Turbo Boost", briefly raising the clock frequency to speeds that can't be safely sustained for extended periods.

Obviously thermal throttling isn't as bad as a CPU crash, but having your whole system slow down isn't great. And if thermal throttling doesn't bring the temperature down to acceptable levels, the processor will usually shut down completely, in a bid to prevent permanent damage. If you don't want your computing experience to be interrupted by intermittent slowdowns and crashes, cooling is a must for any microprocessor device.

PASSIVE AND ACTIVE COOLING

CPU coolers work in a very straightforward way, by physically attaching to the lid of the processor and conducting heat away from it. The simplest sort of cooler is a passive heatsink, typically an all-metal assembly, made of a highly heat-conductive material such as copper or aluminium. The top of the heatsink is usually adorned with dozens of fins or other protuberances that give it a far greater surface area than the lid of the chip, helping it to effectively radiate the heat away. Early generations of Intel chips relied entirely on passive cooling, from the original 4004 processor released in 1971 until the introduction of the faster and more complex 80486 series in 1989.

BELOW **Passive cooling can help keep temperatures down without a fan.**

Passive heatsinks are still used today on super-thin and light laptops, where the designer doesn't want to add the complexity, weight and noise of a fan. The trade-off is that these compact laptops don't offer the highest possible performance: passive cooling can't fully dissipate the heat generated by a powerful CPU running flat out.

That's not to say that passively cooled silicon has to be slow, however. As we mentioned in our recent feature on the latest CPU generations (see *APC* issues 545 & 546), modern processors are now getting down to process sizes of one nanometre and below. As the transistors shrink, so does the power required to operate them – which in turn means that the amount of electrical energy that's converted into heat goes down. It becomes possible to run the chip faster and faster, with more transistors firing at once, without raising the temperature to a problematic

PASSIVE COOLING CAN'T FULLY DISSIPATE THE HEAT GENERATED BY A POWERFUL CPU RUNNING FLAT OUT

ABOVE Air coolers' fans simply blow air across the fins of the heatsink to dissipate heat.

degree, meaning it's possible to get excellent performance from – for example – a MacBook Air using Apple's latest M4 processor with passive cooling.

Even so, there's no denying the advantages of active cooling. There's a MacBook Pro model that uses the exact same M4 processor as the Air, but it proves consistently faster in benchmarks. That's because it combines its heatsink with a powered fan, which blows the heated air away from the heatsink and out of the computer casing, while a vent on the other side of the case draws in fresh, cool air to replace it. This allows the processor to run at higher speeds for longer, without the need for thermal throttling.

Heatsink and fan arrangements – of various sizes and designs – are found in computers of all sizes, from business laptops to massive pedestal servers. But for the most demanding cooling jobs, enthusiasts and data centres may turn to liquid cooling. Here, the heatsink block that's attached to the CPU lid contains conduits for a liquid coolant – typically distilled water, or a chemical mixture similar to the radiator fluid used in a car. This liquid is pumped through tubes to a main heatsink and fan assembly located elsewhere in the case, where the heat is blown away just as with a standard air cooler.

Since the coolant transfers heat more efficiently than air, it can do a better job of carrying heat away from the processor. Moving the main heatsink away from the motherboard also helps to manage ambient temperatures around all the core components. For extreme performance, the cooling liquid itself may be externally cooled for maximum performance: in world-record overclocking attempts, where regular CPUs are pushed to 8GHz and above, liquid nitrogen is often used, at temperatures of around -200°C.

DON'T BRING THE NOISE

As well as efficient heat transfer, another oft-touted advantage of liquid cooling is that, since the fan doesn't need to work as hard as with a standard air cooler, the whole assembly can be quieter. If you've ever heard the fan in your desktop rev up like a motorbike, you'll appreciate the appeal of this.

Modern computers do their best to minimise fan noise – the CPU fan will normally run at a slow, near-silent rate, or stop altogether, when the processor is within a comfortable operating temperature. But as the temperature rises it will ramp up to faster, much noisier speeds. High-end PCs often use several extra fans, which direct and circulate air through the case to maximise throughput with minimal noise. Ironically, the more fans you have is often better, as they can run at lower speeds.

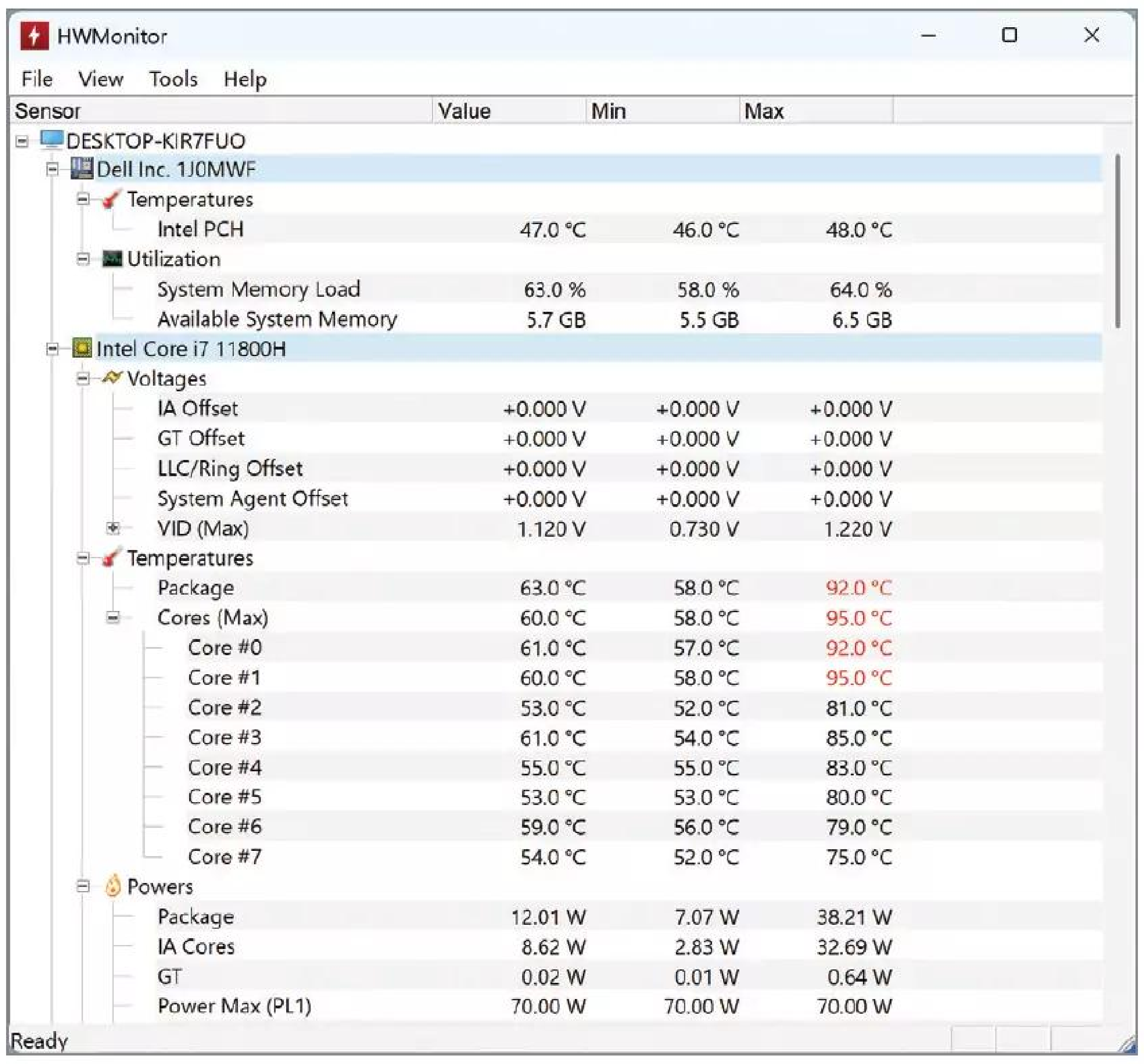
If your fan seems to spring to life at the slightest provocation – spinning up audibly when you do something as simple as opening a web browser – then that might be a sign that your computer is running hotter than it should.

HOW DO I KNOW IF MY COOLING IS INADEQUATE?

As we've mentioned, an overheating CPU will try to manage its own temperature before you get to the point of errors and crashes. So unless you're intentionally overclocking your system and pushing it harder than it can handle, the most likely symptom of a cooling issue is a drop-off in performance, indicating that the system is regularly having to throttle itself. This can be tricky to spot, because processor speeds always fluctuate up and down according to your workload, making it hard to pin down and replicate a suspected slowdown – but if intermittent slowness is accompanied by a fan that's whirring like a jet engine, that's a clue that you need to cool down.

On a smartphone, a tablet or a laptop, you can try the very basic, very unsophisticated approach of running your hands over the casing and seeing if any part of it feels uncomfortably hot. As we've noted, CPUs can handle internal temperatures of over 90°C, so a warm case doesn't necessarily indicate a problem, but if it's painfully hot that's not a good sign. This is why our reviewers often comment on how hot high-end phones get during demanding gaming sessions: the issue isn't just whether the thing is uncomfortable to hold, but also a question of whether the CPU and graphics hardware might be struggling to deliver their best performance.

BELOW HWMonitor shows the operating temperatures of your CPU cores.



Sensor	Value	Min	Max
DESKTOP-KIR7FUO			
Dell Inc. 1J0MWF			
Temperatures			
Intel PCH	47.0 °C	46.0 °C	48.0 °C
Utilization			
System Memory Load	63.0 %	58.0 %	64.0 %
Available System Memory	5.7 GB	5.5 GB	6.5 GB
Intel Core i7 11800H			
Voltages			
IA Offset	+0.000 V	+0.000 V	+0.000 V
GT Offset	+0.000 V	+0.000 V	+0.000 V
LLC/Ring Offset	+0.000 V	+0.000 V	+0.000 V
System Agent Offset	+0.000 V	+0.000 V	+0.000 V
VID (Max)	1.120 V	0.730 V	1.220 V
Temperatures			
Package	63.0 °C	58.0 °C	92.0 °C
Cores (Max)	60.0 °C	58.0 °C	95.0 °C
Core #0	61.0 °C	57.0 °C	92.0 °C
Core #1	60.0 °C	58.0 °C	95.0 °C
Core #2	53.0 °C	52.0 °C	81.0 °C
Core #3	61.0 °C	54.0 °C	85.0 °C
Core #4	55.0 °C	55.0 °C	83.0 °C
Core #5	53.0 °C	53.0 °C	80.0 °C
Core #6	59.0 °C	56.0 °C	79.0 °C
Core #7	54.0 °C	52.0 °C	75.0 °C
Powers			
Package	12.01 W	7.07 W	38.21 W
IA Cores	8.62 W	2.83 W	32.69 W
GT	0.02 W	0.01 W	0.64 W
Power Max (PL1)	70.00 W	70.00 W	70.00 W

The touch test isn't really viable with a desktop PC, but you can use a free tool such as HWMonitor (**www.cpuid.com/softwares/hwmonitor.html**) to directly view the temperature readouts from the internal thermometers built into your processor and motherboard. That particular tool is for Windows only, but there are equivalents available for all other major platforms. For an even more in-depth view you might like to combine this with a CPU monitoring tool such as CPU-Z (**www.cpuid.com/softwares/cpu-z.html**), to track whether the processor's core speeds correlate with changes in temperature.

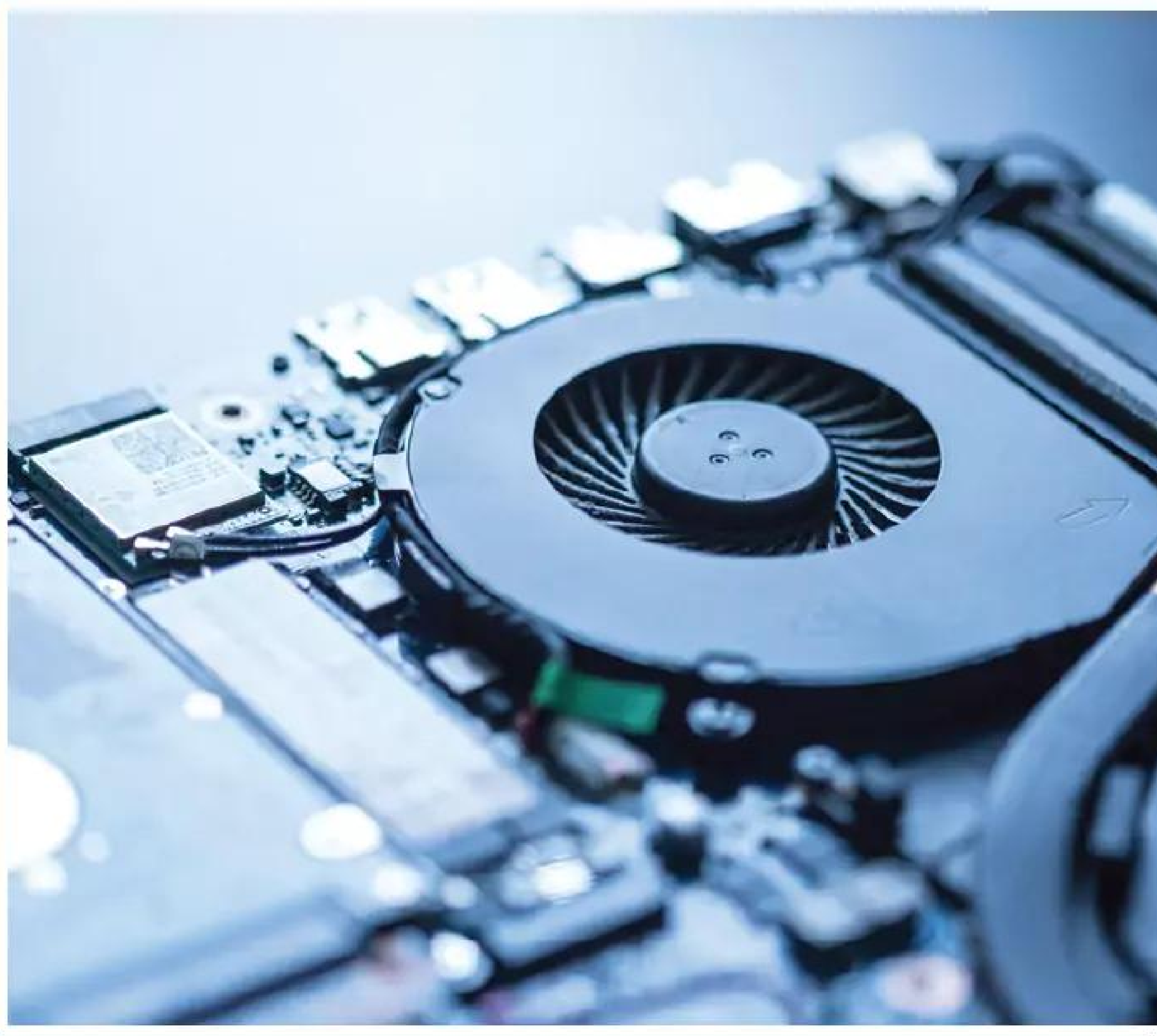
UNDERSTANDING TDP

If you want to know how much heat a particular CPU is likely to generate – and hence what sort of cooling it's likely to need – you can check its thermal design power, or TDP for short. This is an indication of the amount of heat the processor is expected to generate, on average, over a set period of time under a standard workload.

TDP is cited in watts, which might seem confusing at first – we're accustomed to using the watt as a unit of electrical power, not heat. But while TDP deals with a different form of energy, the measure is the same, namely joules per second.

TDP can vary enormously from chip to chip. AMD's top-end Ryzen 9 9950X3D desktop CPU cites a TDP of 170W under full load, indicating that it will need a hefty cooler. By contrast, Intel's Core Ultra 5 225U, designed for lightweight laptops, has a TDP of only 15W, indicating that it will run happily with a much smaller and less powerful cooling system.

Don't get too hung up on these numbers, though: your CPU will almost certainly spend most of its time running well below its stated TDP. If your cooler can't fully dissipate the stated amount of energy, the consequence is likely to be nothing worse than an occasional spot of throttling.



ABOVE Laptop cooling systems are closely integrated with the chassis and can't normally be replaced or upgraded.

That said, there's never any harm in going for the best cooling system you can accommodate. Standard chips won't go above their set Turbo Boost speeds unless you manually overclock them, but with powerful cooling they may be able to use those top speeds more frequently and for longer, while keeping to their preset thermal boundaries.

LOWERING THE TEMPERATURE

If you want to improve your cooling, your best approach will depend very much on the type of device you're using. For a fanless device such as a phone or a thin and light laptop, your options are almost non-existent. Just try to avoid using it in direct sunlight, and always place a laptop on a flat surface like a table, where there's space for air to flow under the chassis, rather than placing it on a pillow on your lap, which will make it warm up extra quickly. You might be able to reduce heat generation by activating a low-power "battery saver" mode, though this will naturally impact on performance as well.

For devices with fixed fans, such as laptops, you may be able to give your cooler a boost by clearing out the vents. Over time, these can get clogged up with dust, impeding the flow of air so the inside of your device doesn't cool effectively. It's tempting to clear it out with a good hearty blow, or use a can of compressed air that you can squirt aggressively into all available openings, but this may exacerbate the problem by pushing dust and debris further into the device, potentially arresting the fans. If you're comfortable with a screwdriver, take the case off and give the internals a thorough blasting – or perhaps use a handheld vacuum cleaner to neatly vanquish any dust and crumbs. You could always seek out a local, trusted, repair technician, who'll resolve the issue for a small consideration.

For traditional tower-style desktop PCs, the situation could hardly be more different. A desktop CPU from AMD or Intel normally comes with a standard "stock" cooler that attaches to the motherboard and keeps the CPU relatively cool, but there's no shortage of third-party replacements, featuring bigger heatsinks and larger, faster fans. These can enable more sustained operation at Turbo speeds, stable overclocking, and quieter operation, too.

Note, though, that these coolers come with no guarantees. Their real-world effectiveness will depend on all sorts of factors, including the workloads you're throwing at your computer and the airflow inside your case. And while all desktop CPUs are guaranteed to hit their advertised frequencies, anything beyond that is a lottery. You might get lucky and find that an upgraded cooler allows your CPU to run stably at 6GHz, or you might be stuck at 5GHz.

If you're shopping for a cooler upgrade, be aware too that different chips may require different fittings.

IF YOU'RE SHOPPING FOR A COOLER UPGRADE, BE AWARE THAT DIFFERENT CHIPS MAY REQUIRE DIFFERENT FITTINGS

LEFT Third-party CPU coolers can be a lot bigger – and more powerful – than stock ones.

In general, any heatsink will clamp on to the flat top of any desktop processor, but the mounting assembly will need to line up with the holes in your motherboard; these may be in different places depending on whether it's an AMD or Intel board, or which generation of chip it is.

A final factor is what goes between the heatsink and the chip. If you just clamp the bottom of the former on to the top of the latter you can expect fairly good cooling, but you will improve matters using a dollop of thermal paste. This greasy substance is designed to ensure gap-free contact over the whole surface of the processor.

There are all sorts of myths concerning the application and type of thermal paste you should use but if you're considering an aftermarket cooler upgrade, we suggest you invest in a small tube of cheap stuff and apply a blob on top of your chip to help the cooler do its thing. ■

5 years of Apple silicon

Written by David Crookes

The first M-series chip was a game-changer when it arrived in 2020. Here we reveal its surprising evolution and find out what's next...

When Apple acquired PA Semi for $278 million in April 2008, few imagined the true impact the purchase would have. At the time, it was suggested Apple was more interested in the fabless, PowerPC chip design company talent and that they would, in all likelihood, primarily work towards the creation of an Apple-owned chip for the iPhone.

No-one really thought it would eventually lead to Apple creating super-powerful chips that would outstrip those of established manufacturers. But that is exactly what happened.

Apple did indeed mainly concentrate on the mobile market at first. The A4 chip made its debut in the first generation iPad in 2010 and, since then, Apple has scaled up and branched out. Drawing on the expertise of a growing number of engineers across the world, it has sought fresh avenues for its technology, namely the S-series of chips for Apple Watch and the H and W chips for AirPods.

Then, on 22 June 2020, as the world was still coming to terms with the widespread effects of the Covid-19 pandemic, Apple's CEO Tim Cook hosted the first online-only Worldwide Developers Conference (WWDC).

Millions watched the live stream from Apple Park and heard Cook talk of a long-rumoured change: Apple's transition to Apple silicon. "With its powerful features and industry-leading performance, Apple silicon will make the Mac stronger and more capable than ever," Cook declared. And he wasn't wrong.

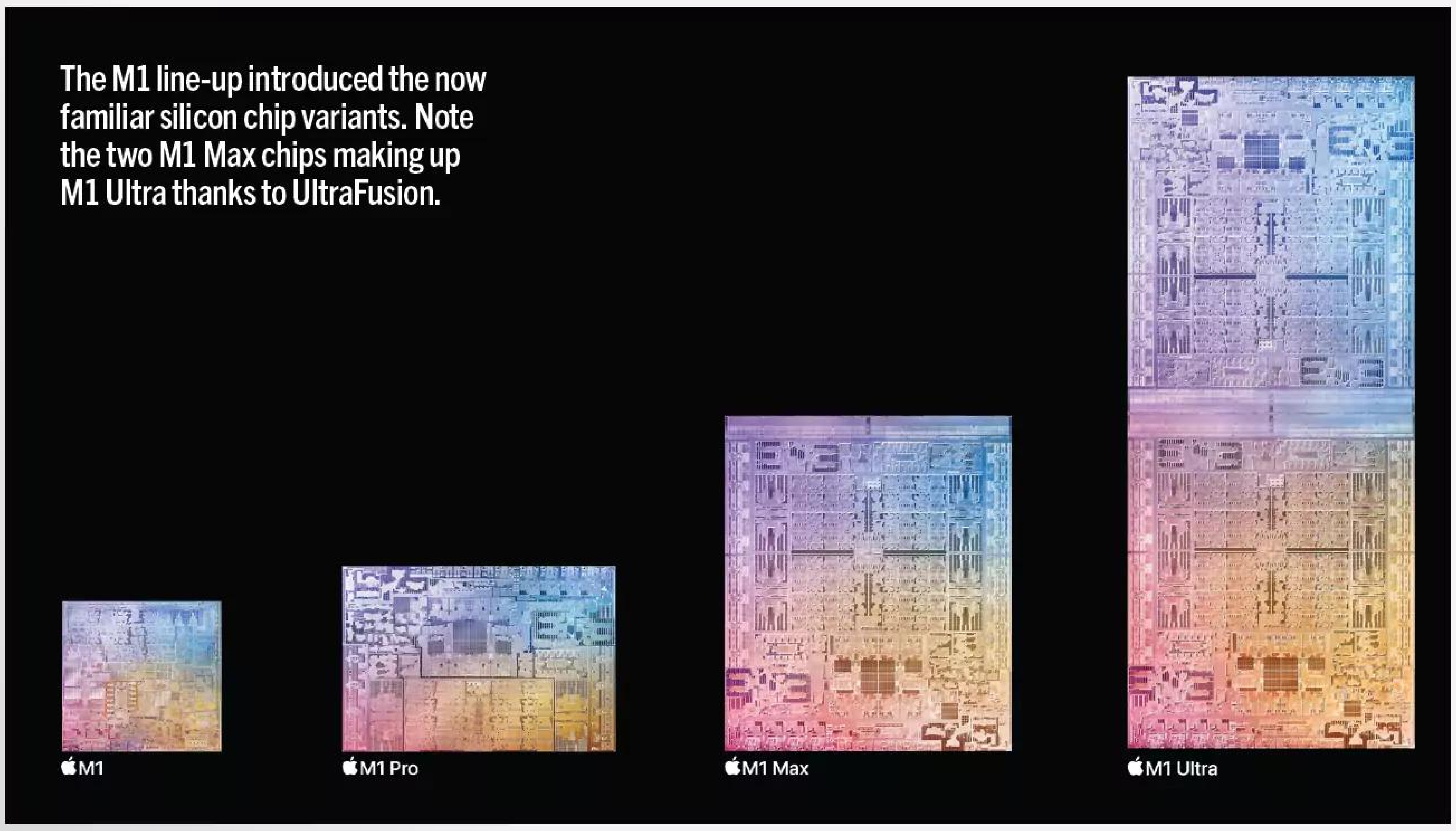
Cook's words heralded the most significant shift in Mac architecture since Apple's switch from PowerPC processors to Intel in 2005. It was also on a par with Apple's move from the Motorola 68000 series to PowerPC processors in 1994.

Power up

In both cases, Apple wanted processors with better performance per watt and simpler instructions for faster execution. "Computer designers use the phrase PPA – Power/Performance/(Chip) Area," David Patterson, the pioneering professor of computer science at the University of California, Berkeley, told *APC*. "PowerPC had better PPA and that's been the reason for each transition from 68000 to PowerPC to Intel x86."

But while such moves were not without their risks, they worked out extremely well. They future-proofed Apple's product line and showed the company's willingness to break with the past and control its own hardware destiny. Fast forward to 2020 and Apple was doing the same again.

While Motorola had been approaching its limits and the PowerPC G5 processor was energy-intensive and generating



The M1 line-up introduced the now familiar silicon chip variants. Note the two M1 Max chips making up M1 Ultra thanks to UltraFusion.

Image credit: Apple Inc

T13NNPCRNV10 MJMCL
T13NNPCRNV10 MJMCL
SM1SRCB ZM87 KMEIGL
SM1SRCB ZM87 KMEIGL
SM1SRCB ZM87 KMEIGL
SM1SRCB ZM87 KMEIGL
T13NNPCRNV10 MJMCL
T13NNPCRNV10 MJMCL

>Image credit: Apple Inc

Apple silicon vs Intel/AMD

Apple silicon is ahead of Intel and AMD chips in many respects. Apple's ARM-based offerings are more power efficient and integrated with its operating systems compared to the x86-based architecture. Apple silicon is also better optimised. Intel and AMD offer stronger GPUs but, in benchmark tests, Apple silicon tends to deliver a better or equal overall performance.

Can this continue? Scaling will become more difficult and Apple could move from a monolithic SoC (a single, integrated circuit containing all of the components) to a chiplet-based design – one that's modular and so easily scaled and customised. Apple may also be forced to separate the CPU and GPU components of its chips to allow even more powerful performance in future but we're not at that stage yet. "I expect Apple to continue with its design of having the GPU tightly integrated with the CPU and Neural Engine in one package as that gives them huge efficiency advantages," Patel says. "While the GPU performance is limited by this strategy, the overall system performance is higher."

excess heat, Intel's chips were also proving to be hot and power-hungry. Intel was also widely reported to be having problems shifting from 14-nanometre (nm) to 10nm chip fabrication. But this time Apple decided to go it alone.

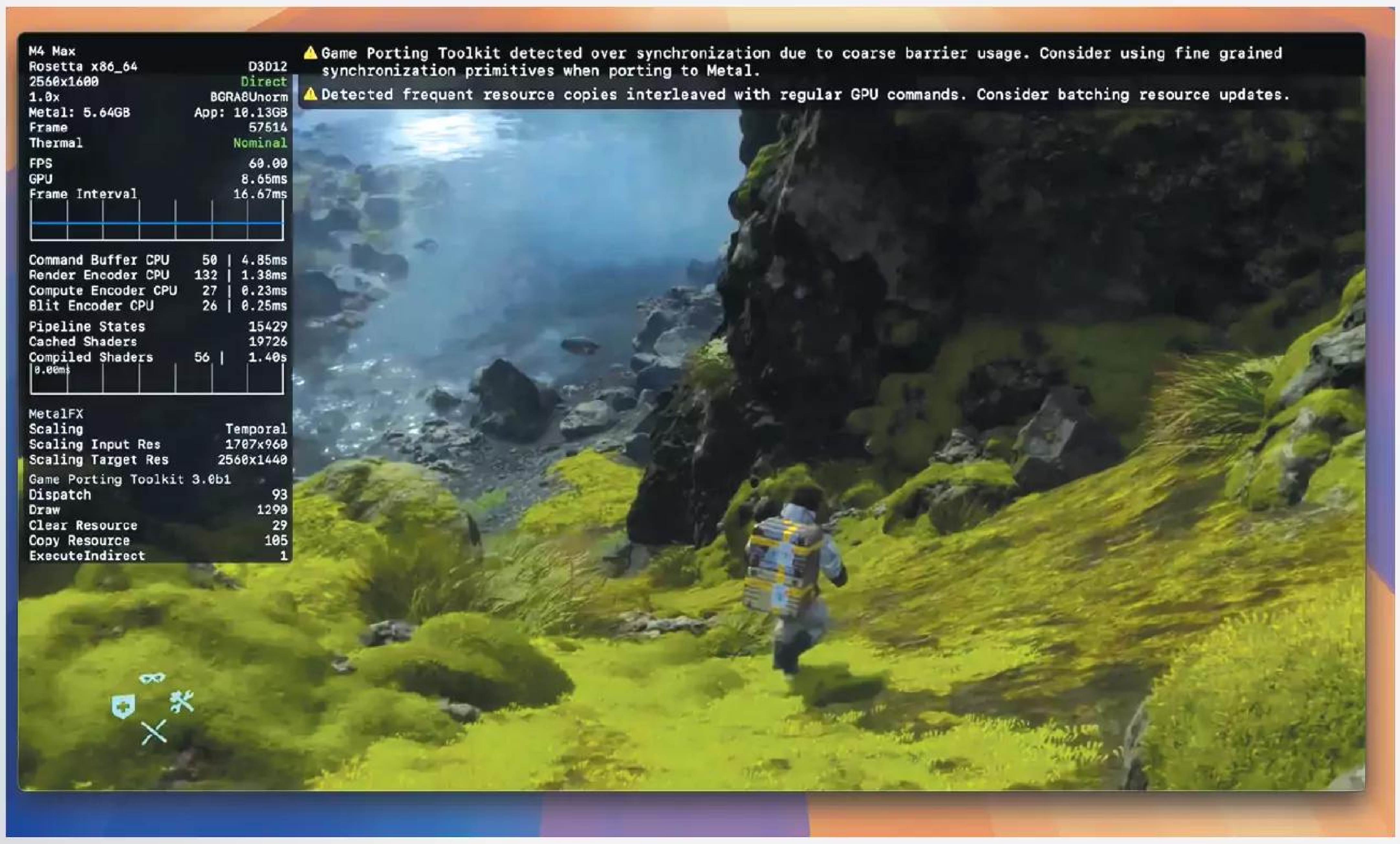
Apple's revolution

The M1 chip was shipped in November 2020 inside the MacBook Air, 13-inch MacBook Pro and Mac mini. With macOS 11 Big Sur engineered to take advantage of its capability and power.

"Apple could customise the chip for its software and develop the software in parallel with the chip using emulators," Daniel Nenni, semiconductor professional and founder of Semiwiki, the open forum for semiconductor professionals, told *APC*. "Android and the companies that use Intel x86 do not have that competitive advantage."

It meant Apple was in a position to fine-tune both its hardware and software, maximising performance and efficiency. The M1, built using 5nm process technology, was also impressive. It consisted of an 8-core CPU (Central Processing Unit) made up of four performance cores and four efficiency cores. It also had 16 billion transistors which Apple said was the most it had ever put into a chip, and it boasted a GPU (Graphics Processing Unit) featuring up to eight cores, capable of running nearly 25,000 threads simultaneously.

Rather than have multiple chips for the CPU, GPU, I/O (input/output), security and so on, the M1 combined the technologies into a single system on a chip (SoC) for tighter integration and power efficiency. The chip also had many groundbreaking features including unified memory architecture.



```
M4 Max
Rosetta x86_64                    D3D12
2560x1600                        Direct
1.0x                         BGRA8Unorm
Metal: 5.64GB             App: 10.13GB
Frame                             57514
Thermal                         Nominal
FPS                               60.00
GPU                              8.65ms
Frame Interval                  16.67ms

Command Buffer CPU     50 | 4.85ms
Render Encoder CPU    132 | 1.38ms
Compute Encoder CPU    27 | 0.23ms
Blit Encoder CPU       26 | 0.25ms
Pipeline States                   15429
Cached Shaders                    19726
Compiled Shaders       56 |       1.40s
0.00ms

MetalFX
Scaling                        Temporal
Scaling Input Res              1707x960
Scaling Target Res            2560x1440
Game Porting Toolkit 3.0b1
Dispatch                             93
Draw                               1290
Clear Resource                       29
Copy Resource                       105
ExecuteIndirect                       1
```

```
⚠ Game Porting Toolkit detected over synchronization due to coarse barrier usage. Consider using fine grained
  synchronization primitives when porting to Metal.
⚠ Detected frequent resource copies interleaved with regular GPU commands. Consider batching resource updates.
```

Metal 4, designed for Apple silicon and coming with macOS 26, supports advanced graphics and machine learning.

Tim Millet, Apple's vice president of Platform Architecture and Hardware Tech, introduces the M1.

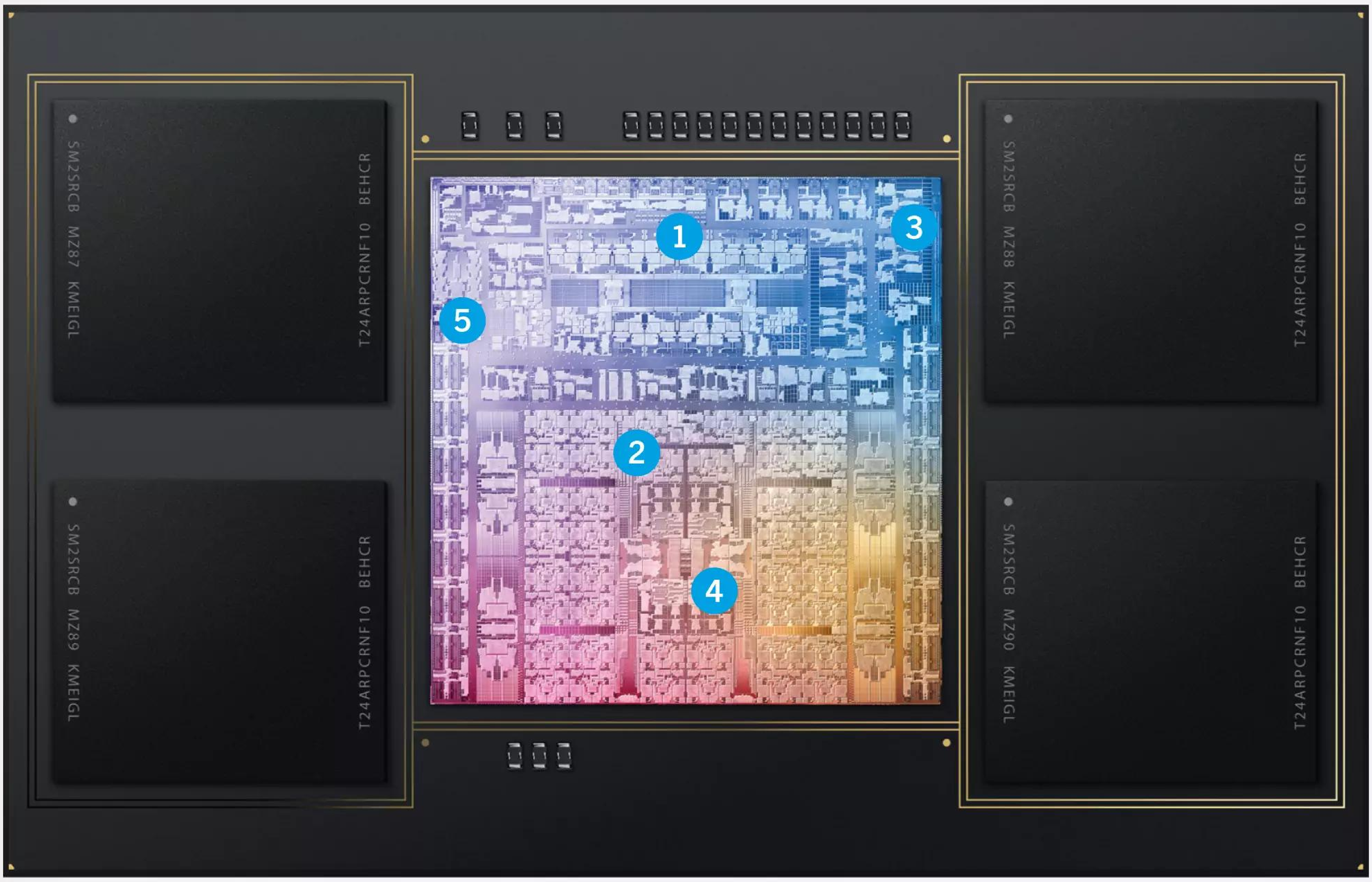
Unified memory has important benefits over traditional memory architecture. Instead of giving the various processing units their own memory, they're granted access to a single, shared pool of RAM on the same SoC.

Whereas the use of multiple chips would lead to data being copied between, say the CPU and GPU, these components on an SoC can dip into the same RAM (Random Access Memory) directly allowing memory to be accessed and processed more quickly. Memory can also be allocated based on need – if there is unused memory and the GPU requires it, it can take some. It ensured memory went further compared to traditional PC architectures, more so given the tight integration of macOS.

The M1 also included a Neural Engine for on-device machine learning. This neural processing unit (NPU) worked more quickly and efficiently than if machine learning and artificial intelligence tasks were left to the CPU and GPU. "The Neural Engine is good for camera, photo and video tasks,"

› Image credits: Apple Inc, Kojima Productions Co Ltd

EXPLAINED… Inside Apple silicon >



①
CPU
Handling the core computing tasks, Apple silicon's CPU uses a combination of both performance and efficiency cores for optimal performance and power consumption.

②
GPU
Tightly integrated with the CPU and sharing the same memory pool, the GPU can now accelerate ray-tracing and mesh shading – great for games and creative work.

③
Display engine
The display engine manages what you can see on the screen. The M4 series can support multiple external displays; devices with the M4 Pro or M4 Max chips can handle up to four.

④
Media Engine
Developed with video editing professionals in mind, the Media Engine can handle the encoding and decoding of high quality video codecs such as H.264, HEVC and ProRes.

⑤
Neural Engine
The Neural Engine powers AI and machine learning – it drives Apple Intelligence and features such as Face ID without impacting either CPU or GPU performance.

Dylan Patel, founder, CEO and chief analyst at SemiAnalysis, told *APC*. Introduced with the Apple A11 Bionic chip, this energy-efficient cluster of specialised compute cores can process images to analyse objects, detect faces, recognise voices, understand natural language and more.

As Apple improved on M1 technology, it went on to produce more powerful M1 Pro, M1 Max and M1 Ultra chips. The M1 Pro and M1 Max introduced the Media Engine, used to accelerate video processing while maximising battery life. The original M1 handed this task to the CPU/GPU but a dedicated engine has boosted performance, playback and export speeds, in particular for the visually lossless, lossy video compression format Apple ProRes.

The M1 Ultra, meanwhile, introduced UltraFusion, a custom interconnect technology which enabled two M1 Max chips to be combined into a single, larger M1 Ultra chip without having to go via a logic board.

"UltraFusion uses a silicon interposer that connects the chips across more than 10,000 signals, providing a massive 2.5TB/sec of low-latency, inter-processor bandwidth," Apple said. It created a doubled-up chip that behaved as one, providing immense power.

The M1 had 16 billion transistors – the most Apple had ever put into a chip

M2 and beyond

Since then we have seen the launch of M2, M3 and M4 series chips, released to a somewhat 'eccentric' schedule. Most chip-makers release their most powerful chips for each generation first and follow up with lower-powered chips – Nvidia, for example, launched the GeForce RTX 4090 and gradually released lower-powered chips such as the entry-level GeForce RTX 4060 while Intel released the Core i9 >

> Image credit: Apple Inc

The M2 series of chips heralded the completion of Apple's transition from Intel across all Macs.

and i7 processors first and the i5 and i3 models later. Apple, however, has been doing the opposite.

The M2 arrived for the MacBook Air and 13-inch MacBook Pro in June 2022 and we saw the M2 Pro/Max released the following January, with the M2 Ultra coming last in June 2023.

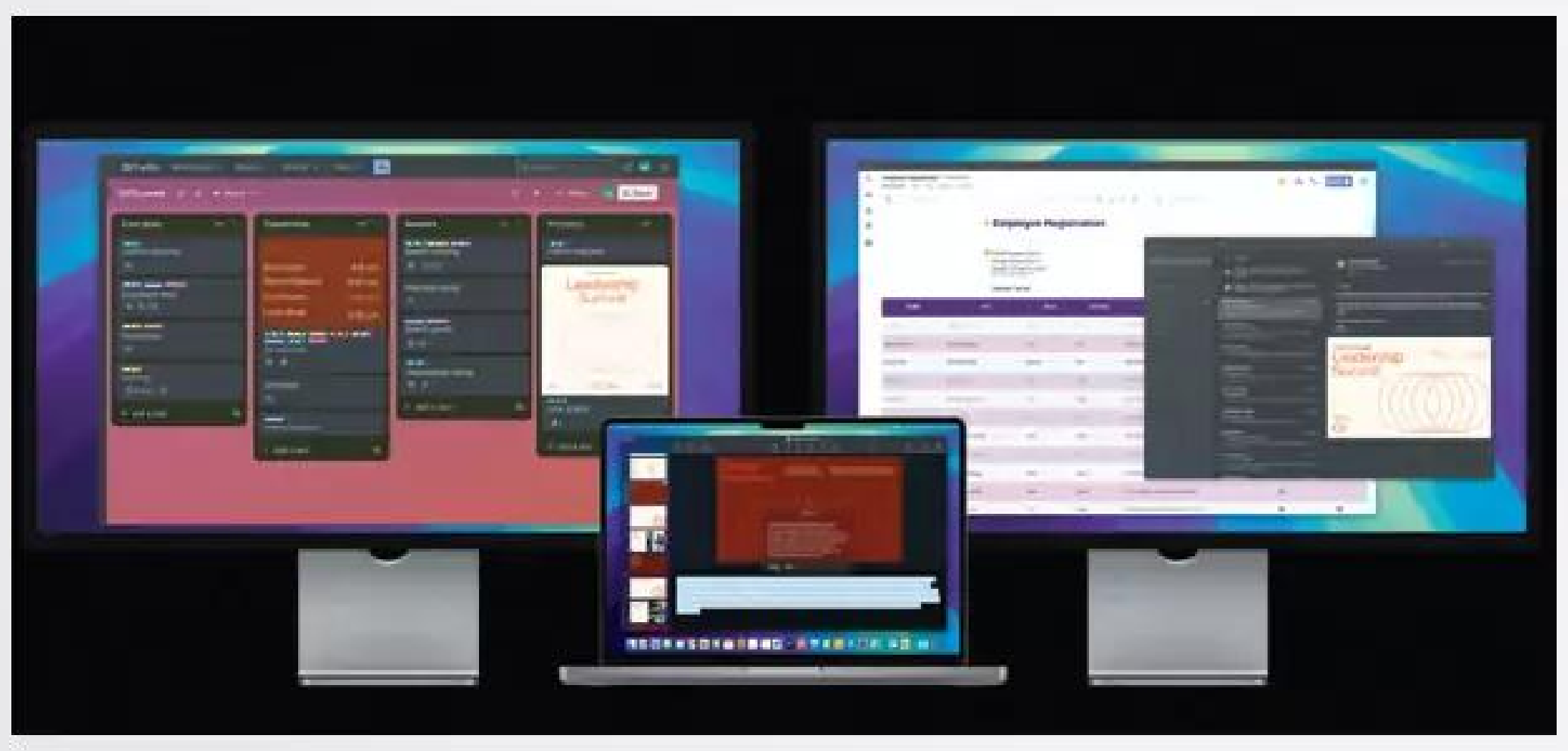
One potential reason for this is Apple's different priorities. "Because we're not really selling chips outside, we focus on the product," Johny Srouji, Apple's senior vice president of hardware engineering, told *CNBC* in 2023 when discussing the company's overall strategy. By launching the base M-series chips first and creating advanced versions later, Apple can introduce silicon in the most popular Macs then tailor chips to specific product needs.

Apple has also been quick to identify problems in its silicon journey and get things back on track. When it introduced the M3 in October 2023, for instance, it unleashed chips built on a cutting-edge 3nm process, allowing for higher transistor density. It also allowed for new GPU features such as Dynamic Caching, hardware-accelerated ray tracing and mesh shading. But there were signs it had arrived too early with reports that the world's largest and most advanced semiconductor foundry, the Taiwan Semiconductor Manufacturing Company (TSMC), was struggling to meet demand.

Within months, at its 'Let Loose' event in May 2024, Apple announced the M4, created using more effective second-gen 3nm tech. Since then the M4 has found its way into the iMac, Mac mini, MacBook Pro and MacBook Air, with M4 Pro and M4 Max variants arriving in November 2024. These more powerful chips duly ended up in the Mac mini, MacBook Pro and Mac Studio (with the latter also offering an M3 Ultra chip with up to 32 CPU cores and 80 GPU cores). It's been a big success.

Next steps

But what does the future hold? Well, the general belief is that Apple can sustain the evolution of its chips. "One of the reasons why Apple can release new silicon every year



Connect a couple of external displays to a MacBook via a Thunderbolt or HDMI port and the M4 is more than capable of supporting them.

Apple's silicon revolution

M1

Introduced in November 2020

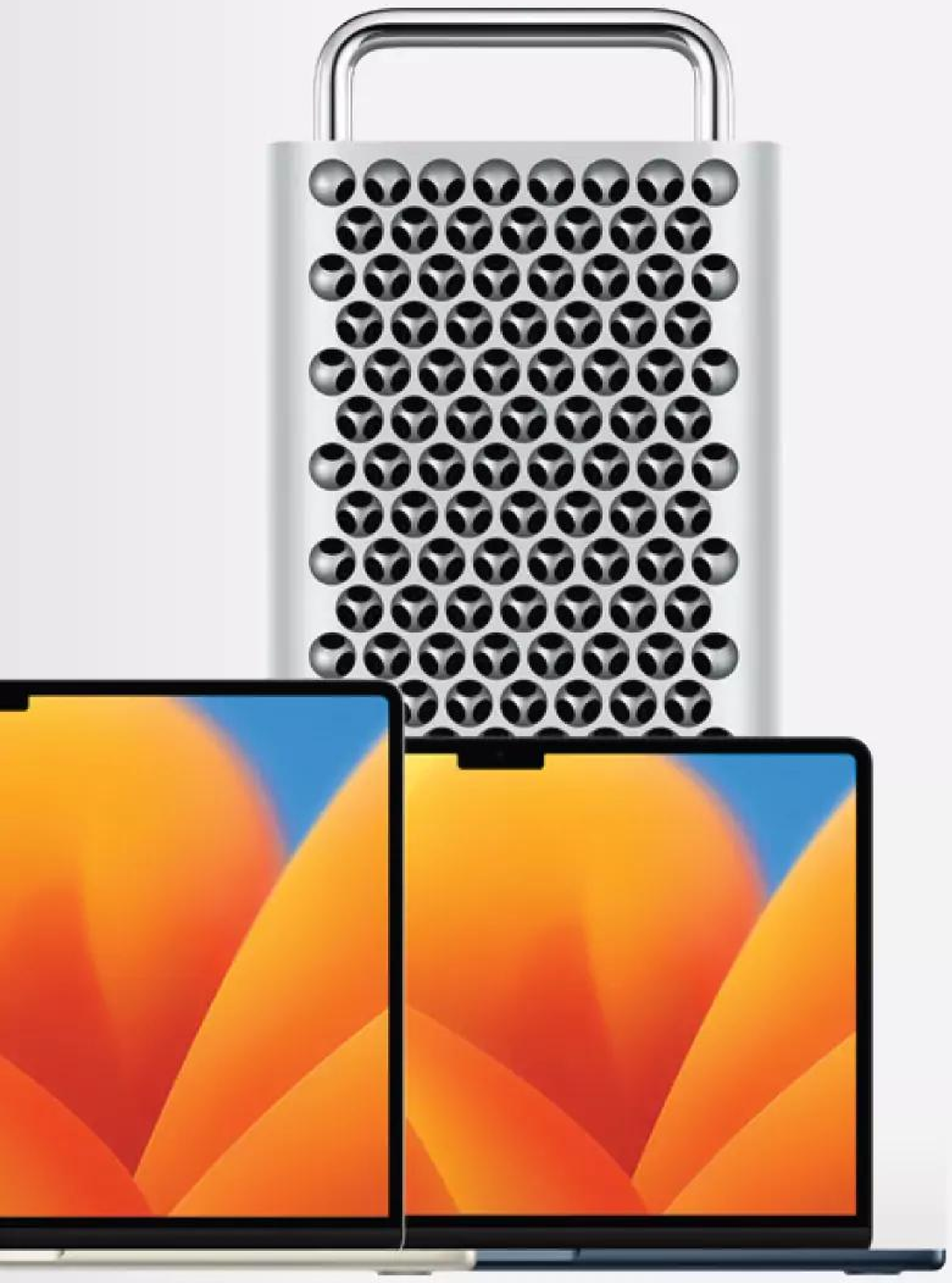
Unified memory and GPU integration along with the speedy Neural Engine made the base M1 chip a game-changer. CPU and GPU performance were up to 3.5x and 6x faster compared to the latest PC laptop chips at the time. Faster M1 Pro, M1 Max and M1 Ultra variants followed.

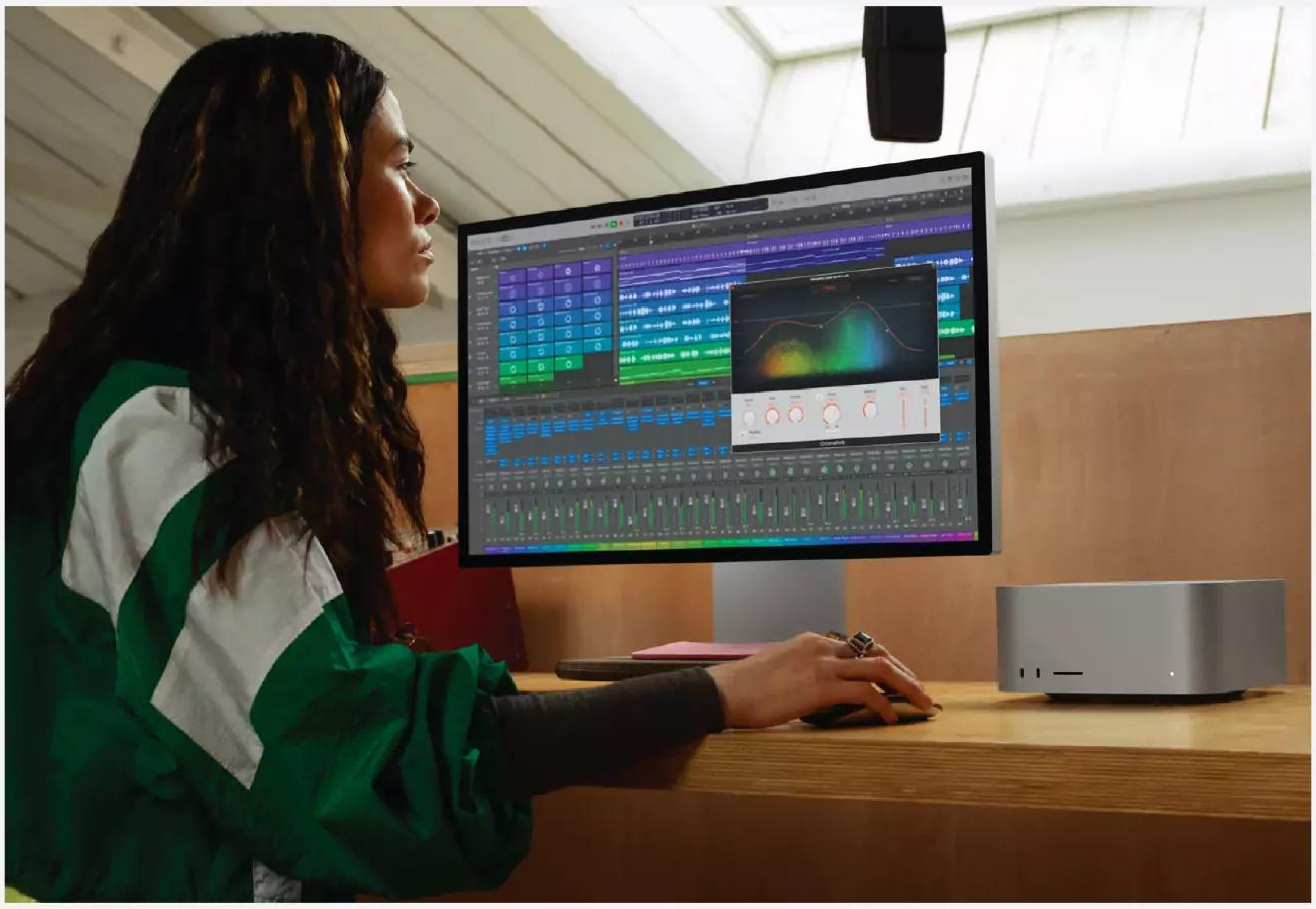
M2

Introduced in June 2022

The M2 chip built on the success of the M1 and it was initially included in the MacBook Air and 13-inch MacBook Pro. It brought more efficient and faster CPU cores, a faster Neural Engine, high memory bandwidth and support for more memory and more GPU cores.

> Image credit: Apple Inc





Apple silicon delivers fast and efficient performance making it capable of even the most demanding of tasks.

is that the designs are iterative," Nenni says. "In general, they add features to an existing design without changing the whole architecture."

Apple also controls the full stack: silicon, software and hardware which gives it an edge. "That type of control is critical to Apple's success," says Nenni. "Always has been, always will be." It helps enormously that Apple enjoys close ties with TSMC which gives it priority access to the latest and greatest fabrication tech.

"Apple's relationship with TSMC has been critical to Apple's silicon success," says Nenni. "If TSMC disappeared, Apple would be in big trouble, but so would the world since TSMC supplies 99% of the leading edge silicon that makes AI [artificial intelligence] possible." What's more, since Apple chips use ARM-based chips – those built to the rules of ARM instruction set architecture (as opposed to the x86 architecture as used by both Intel and AMD for their processors) – across the Mac, iPhone, iPad, Vision Pro and Apple Watch, it allows for the optimised development of cross-platform apps and operating systems.

"Apple is also experimenting with RISC-V so it has options in case ARM is no longer an option," Nenni says. Again, it's a case of Apple looking to reduce reliability on third parties. "Apple is still ahead on performance per watt versus Qualcomm, Intel and AMD," says Patel.

Eyes are now focused on what the M5 chips, due to arrive later this year, are likely to bring to the table. "With M5 Macs, Apple will integrate greatly improved memory and packaging technologies, leading to their efficiency advantage coming back," Patel adds. ■

M3

Introduced in October 2023

The M3 was built using a 3-nanometre (3nm) process. Including hardware ray tracing, mesh shading, Dynamic Caching and a unified shading architecture allowed for better rendering, more intelligent memory allocation and simpler programming techniques.

M4

Introduced in May 2024

This hugely powerful and efficient chip made its debut with the iPad Pro. The Neural Engine is capable of 37 trillion operations per second and Apple points to its new display engine and up-to-10 core CPU with four performance cores and six efficiency cores.

M5

To be confirmed

Likely to be released in the first half of 2026, says Bloomberg tech journalist Mark Gurman, the M5 series may be a chip refresh rather than a leap forward. Apple is already working on M6 and M7 chips as well as an AI accelerator for its own data centres.

› Image credit: Apple Inc

Q3 Analysis Report
Interactive Displays
Presenter
June 2021
AI Companion
Catch me up
ViewSonic

MONITOR MEGATEST

Whatever size, shape or price of monitor you're looking for, one of these 19 displays holds the answer.

When we set out on the month-long journey that is a Labs, we have one thing in mind: to provide a comprehensive overview of the market so that you can buy with confidence.

Here, we concentrate on mainstream monitors. There are a handful of truly premium models here, but most are aimed at so-called typical users: these monitors would be equally happy in a home office as a work office, several are ideal for students, while a few will also appeal to creative professionals. We only drew the line at out-and-out gaming monitors.

The end result is an exhaustive test of 19 current monitors varying from compact 24in displays (also worth considering as secondary screens) to 34in widescreen monsters. In the unlikely event that you can't find exactly the right screen for you, then also read our "What to look for when buying a monitor" guide on p66 as it should steer you to the right choice.

CONTRIBUTORS **Rowan Campbell, Tim Danton**

The International Law Association
Certificate Of Appreciation
Mr.C. W. Hsieh

CONTENTS

24IN MONITORS

AOC 24B3HA2 68
Asus ZenScreen MB249C....68
Eizo FlexScan EV2410R 69

27IN MONITORS

Acer Vero CB272K....70
BenQ GW2790QT 70
Dell 27 Plus 4K USB-C....71
Eizo FlexScan EV2740X....71
HP Series 5 Pro 527pq 72
Iiyama ProLite XUB2797QSNP 72
MSI Pro MP275QPDG 73
ViewSonic ColorPro VP2788-5K 73
Asus ZenScreen Smart Monitor MS27UC 74
BenQ DesignVue PD2730S....75

32/34IN MONITORS

Acer SH322QU 76
HP P34hc G4 Curved Monitor 77
MSI Modern MD342CQPW 77
Philips 34B2U6603CH....78
ViewSonic VG3457CV 78
Iiyama ProLite XCB3497WQSNP....79

Feature comparison table....64
What to look for when buying a monitor 66
Time to dock....69
How we test....80
Graphs 80
View from the Labs....81

	24in MONITORS			27in MONITORS					
					RECOMMENDED	RECOMMENDED	LABS WINNER		
	AOC 24B3HA2	**Asus ZenScreen MB249C**	**Eizo FlexScan EV2410R**	**Acer Vero CB272K**	**Asus ZenScreen Smart Monitor MS27UC**	**BenQ GW2790QT**	**BenQ DesignVue PD2730S**	**Dell 27 Plus 4K USB-C**	**Eizo FlexScan EV2740X**
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★★☆
BUYING INFORMATION									
Price	$119	$787	$687	$491	$883	$459	$1,999	$379	$1,700
Site	aoc.com	asus.com	eizoglobal.com	acer.com	asus.com	benq.com	benq.com	dell.com	eizo.com
SERVICE & SUPPORT									
Warranty	3yr limited	3yr limited	5yr limited	3yr limited	3yr limited	3yr limited	3yr limited	3yr limited	5yr limited
EPEAT rating	✗	✗	Gold with Climate+	Silver	✗	Bronze	Gold	✗	Gold with Climate+
DISPLAY									
Panel size	23.8in	23.8in	24.1in	27in	27in	27in	27in	27in	27in
Resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,200	3,840 x 2,160	3,840 x 2,160	2,560 x 1,440	5,120 x 2,880	3,840 x 2,160	3,840 x 2,160
Aspect ratio	16:9	16:9	16:10	16:9	16:9	16:9	16:9	16:9	16:9
Pixel density	93ppi	93ppi	94ppi	163ppi	163ppi	109ppi	218ppi	163ppi	163ppi
Panel type	IPS	IPS	IPS	IPS	IPS	IPS	IPS	IPS	IPS
Curvature	✗	✗	✗	✗	✗	✗	✗	✗	✗
KEY SPECIFICATIONS									
Peak brightness (stated)	250cd/m^2	350cd/m^2	350cd/m^2	350cd/m^2	350cd/m^2	350cd/m^2	400cd/m^2	350cd/m^2	350cd/m^2
Static contrast ratio (stated)	1,300:1	1,000:1	1,300:1	1,000:1	1,000:1	1,000:1	2,000:1	1,500:1	2,000:1
Display colours	16.8 million	16.8 million	16.8 million	1.07 billion	1.07 billion	16.8 million	1.07 billion	1.07 billion	16.8 million
Colour depth	6-bit + FRC	6-bit + FRC	8-bit	8-bit + FRC	10-bit	6-bit + FRC	8-bit + FRC	8-bit + FRC	8-bit
DisplayHDR certification	✗	✗	✗	✗	DisplayHDR 400	✗	DisplayHDR 400	✗	✗
Maximum frequency (vertical)	100Hz	75Hz	60Hz	60Hz	60Hz	75Hz	60Hz	120Hz	60Hz
Claimed response time (grey to grey)	4ms	5ms	5ms	4ms	5ms	5ms	Not stated	4ms	5ms
Adaptive sync?	✓	✓	✗	✓ (AMD FreeSync)	✓	✗	✓ (AMD FreeSync Premium)	✓ (AMD FreeSync Premium)	✗
VIDEO INPUTS/OUTPUTS									
DisplayPort (version)	✗	✗	✓ (1.3)	1 (1.2)	1 (1.4)	1 (1.2)	1 (1.4)	✗	1 (1.2)
HDMI (version)	✓ (1.4)	✓ (1.4)	✓ (1.4)	2 (2.0)	1 (2.0)	1 (1.4)	1 (2.1)	2 (2.0)	2 (2.0)
USB-C (power rating)	✓ (65W)	✓ (60W)	✗	✗	✓ (90W)	✓ (65W)	✓ (90W, Thunderbolt 4)	✓ (65W)	✓ (94W)
Daisy chaining	✗	✗	✗	✗	✗	✓	✗	✗	✗
Other	✗	✗	D-SUB, DVI-D	✗	✗	DisplayPort out	Thunderbolt 4 out (15W)	✗	✗
PORTS & DOCKING									
RJ45 (1GbE unless stated)	✗	✗	✗	✗	✗	✗	✗	✗	✓
USB-A	2 (USB 3.2 Gen 1)	✗	4 (USB 3.2 Gen 1)	✗	2 (USB 2)	3 (USB 3.2 Gen 1)	3 (USB 3.2 Gen 1)	2 (USB 3.2 Gen 1)	3 (USB 3.2 Gen 1)
USB-B	✗	✗	✓	✗	✗	✗	✗	✗	✓
USB-C (power rating)	✗	✗	✗	✗	✗	✓ (7.5W)	✓ (7.5W)	✓ (15W)	✓ (15W)
Headphones socket	✓	✓	✓	✓	✓	✓	✓	✗	✓
Other	✗	✗	✗	✗	Bluetooth 5.2, Wi-Fi 5	✗	✗	✗	Line out
STAND FEATURES									
Adjustable height	110mm	180mm (with arm)	130mm	165mm	100mm	110mm	150mm	130mm	195mm
Portrait mode	✗	✓ (with arm)	✓	✓	✗	✓	✓	✓	✓
Tilt angle (forward/back)	5°/23°	5°/20° (with arm)	5°/35°	5°/35°	5°/18°	5°/20°	5°/20°	5°/21°	5°/35°
Swivel angle (left/right)	✗	90°/90° (with arm)	180°/180°	178°/178°	✗	20°/20°	30°/30°	30°/30°	45°/45°
OTHER FEATURES									
Webcam	✗	✓	✗	✗	✗	✗	✗	✗	✗
KVM	✗	✗	✗	✗	✗	✗	✓	✗	✗
VESA mount [1]	✓	✓	✓	✓	✓	✓	✓	✓	✓
Integrated power supply	✓	✗	✓	✓	✓	✓	✓	✓	✓
Speakers	2 x 2W	2 x 1W	2 x 1W	2 x 2W	2 x 5W	2 x 2W	2 x 3W	2 x 5W	2 x 2W
Cables supplied [2]	HDMI, USB-C	HDMI, USB-C	DP, USB-B	HDMI	DP, HDMI, USB-C	HDMI, USB-C	DP, HDMI, TB4	HDMI, USB-C	DP, USB-C
Other	✗	C-clamp	Eizo Screen InStyle	✗	Google TV, remote control	Microphone	Display Pilot 2, Hotkey Puck G3	Dell Display and Peripheral Manager	Eizo Screen InStyle
SIZE & WEIGHT									
Dimensions with stand (WDH) [3]	542 x 230 x 360-470mm	539 x 23.6 x 346mm	531 x 233 x 358-488mm	614 x 270 x 390-555mm	614 x 170 x 409-509mm	614 x 239 x 424-534mm	614 x 242 x 428-578mm	612 x 200 x 389-519mm	612 x 242 x 371-566mm
Weight with stand	4.6kg	4.8kg	6kg	8.3kg	6kg	8.4kg	8.2kg	6.7kg	8.2kg

---

[1] 100 x 100mm unless stated. [2] All monitors include power cables. DP = DisplayPort, TB4 = Thunderbolt 4. USB-B denotes a USB-B to USB-A cable. [3] Includes stand at its lowest height for monitors with height adjustment.

				32/34in MONITORS					
	RECOMMENDED		RECOMMENDED			RECOMMENDED	RECOMMENDED	RECOMMENDED	
HP Series 5 Pro 527pq	**Iiyama ProLite XUB2797 QSN**	**MSI Pro MP275QPDG**	**ViewSonic ColorPro VP2788-5K**	**Acer SH322QU**	**HP P34hc G4 Curved Monitor**	**Iiyama ProLite XCB3497 WQSNP**	**MSI Modern MD342CQPW**	**Philips 34B2U 6603CH**	**ViewSonic VG3457CV**
★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★★★	★★★★★	★★★★☆	★★★★☆
$399	$504	$479	$1,579	$279	$743	$634	$699	$1,199	$1,227
hp.com	iiyama.com	msi.com	viewsonic.com	acer.com	hp.com	iiyama.com	msi.com	philips.com.au	viewsonic.com
3yr limited	5yr limited	2yr limited	3yr limited	2yr limited	3yr limited	5yr limited	3yr limited	3yr limited	5yr limited
Gold with Climate+	Silver	✗	Silver	✗	Gold	Silver	✗	Gold	✗
27in	27in	27in	27in	31.5in	34in	34in	34in	34in	34.1in
2,560 x 1,440	2,560 x 1,440	2,560 x 1,440	5,120 x 2,880	2,560 x 1,440	3,440 x 1,440	3,440 x 1,440	3,440 x 1,440	3,440 x 1,440	3,440 x 1,440
16:9	16:9	16:9	16:9	16:9	21:9	21:9	21:9	21:9	21:9
109ppi	109ppi	109ppi	218ppi	93ppi	110ppi	110ppi	110ppi	110ppi	109ppi
IPS	IPS	IPS	IPS	IPS	MVA	MVA	MVA	MVA	MVA
✗	✗	✗	✗	✗	1500R	1500R	1500R	1500R	1500R
350cd/m²	300cd/m²	250cd/m²	500cd/m²	300cd/m²	250cd/m²	350cd/m²	300cd/m²	350cd/m²	350cd/m²
1,500:1	1,300:1	1,300:1	2,000:1	1,000:1	3,500:1	3,000:1	3,500:1	4,000:1	3,000:1
16.8 million	16.8 million	1.07 billion	1.07 billion	1.07 billion	16.8 million	16.8 million	1.07 billion	16.8 million	1.07 billion
8-bit	8-bit	8-bit + FRC	8-bit + FRC	8-bit + FRC	8-bit	8-bit	8-bit + FRC	8-bit	8-bit + FRC
✗	✗	✗	DisplayHDR 400	✗	✗	✗	✗	DisplayHDR 400	✗
100Hz	100Hz	100Hz	75Hz	75Hz	60Hz	120Hz	120Hz	120Hz	100Hz
5ms	4ms	4ms	5ms	4ms	5ms	14ms	4ms	4ms	5ms
✗	✓	✓	AMD FreeSync Premium	✓	✗	AMD FreeSync Premium	AMD FreeSync Premium	✓	✗
1 (1.4)	1 (1.4)	1 (1.2a)	1 (1.4)	1 (1.2)	1 (1.2)	1 (1.4)	1 (1.4a)	1 (1.4)	1 (1.2)
1 (2.0)	2 (2.0)	2 (2.0b)	1 (2.1)	1 (2.0)	1 (2.0)	2 (2.0, 1.4)	2 (2.0b)	2 (2.0)	2 (2.0)
✓ (100W)	✓ (96W)	✓ (98W)	✓ (100W, Thunderbolt 4)	✓ (65W)	✓ (65W)	✓ (95W)	✓ (98W)	✓ (100W, Thunderbolt 4)	✓ (100W)
✓	✓	✓	✓	✗	✗	✗	✗	✓	✗
DisplayPort out	DisplayPort out	DisplayPort out	Thunderbolt 4 out	✗	✗	✗	✗	Thunderbolt 4 out	✗
✓	✓	✓	✗	✗	✗	✓	✗	✓ (2.5GbE)	✓
3 (USB 3.2 Gen 1)	3 (USB 3.2 Gen 1)	4 (USB 3.2 Gen 1)	2 (USB 3.2 Gen 2)	✗	4 (USB 3.2 Gen 1)	2 (USB 3.2 Gen 1)	2 (USB 3.2 Gen 1)	4 (USB 3.2 Gen 2)	4 (USB 3.2 Gen 1)
✓	✗	✓	✗	✗	✓	✓	✓	✗	✗
✓ (15W)	✓ (15W)	✗	✓ (2 x 15W)	✗	✗	✓ (2 x 7.5W)	✗	✓ (45W)	✓ (15W)
✓	✓	✓	✓	✓	✓	✓	✓	✓ (combo)	✓
✗	✗	✗	✗	✗	✗	✗	✗	✗	IR sensor
150mm	150mm	130mm	120mm	100mm	130mm	150mm	110mm	180mm	110mm
✓	✓	✓	✓	✗	✗	✗	✗	✗	✗
5°/20°	5°/23°	5°/20°	5°/22°	5°/15°	5°/21°	5°/23°	5°/20°	5°/30°	5°/40°
45°/45°	45°/45°	45°/45°	30°/30°	180°/180°	✗	45°/45°	30°/30°	180°/180°	60°/60°
✓ (5MP)	✗	✓ (1080p)	✗	✗	✗	✓ (5MP)	✗	✓ (5MP)	✓ (5MP)
✓	✓	✓	✓	✗	✗	✓	✓	✓	✗
✓	✓	✓	✓	✓ (75 x 75mm)	✓	✓	✓ (75 x 75mm)	✓	✓
✓	✓	✓	✗	✗	✓	✓	✗	✓	✓
4 x 3W	2 x 2W	2 x 2W	2 x 5W	2 x 1W	2 x 3W	2 x 5W	2 x 3W	2 x 5W	2 x 5W
DP, USB-B, USB-C	DP, HDMI, USB-C	HDMI, USB-B, USB-C	DP, HDMI, TB4, USB-A	HDMI, USB-C	DP, HDMI, USB-C	DP, HDMI, USB-B, USB-C	DP, USB-B	DP, HDMI, TB4	HDMI, USB-C
HP Display Center	✗	MSI Productivity Intelligence	✗	✗	HP Display Center	✗	✗	Earphone hook, human sensor, microphone	LED fill light
613 x 229 x 394-544mm	614 x 210 x 401-551mm	614 x 234 x 449-579mm	613 x 210 x 423-543mm	715 x 269 x 421-521mm	809 x 235 x 388-518mm	807 x 240 x 443-593mm	809 x 251 x 424-534mm	807 x 281 x 395-575mm	808 x 236 x 424-534mm
7.9kg	6.1kg	7.1kg	6.4kg	7.5kg	10.5kg	9.7kg	8.1kg	11.2kg	9.5kg

What to look for when buying a monitor

Before you jump into individual reviews, it's worth considering the bigger picture when selecting which display is right for you.

How big should you go?

This question isn't as easy to answer as it may seem. For example, if you're on a tight budget, a 24in Full HD monitor may make perfect sense, not least because text will look sharper than the same resolution (1,920 x 1,080) on a 27in panel.

However, rules of thumb apply. The first is that larger is generally better – but only if the number of pixels per square inch, the pixel density, remains above a certain level. For most people, that means around the 100ppi mark: you can get away with 92ppi (the pixel density of a 24in Full HD panel), but you'll notice a jump in sharpness if you choose a 27in monitor with a 2,560 x 1,440 resolution as that works out to 109ppi.

The second rule of thumb is that people's perception of sharpness diminishes once you go above 110ppi. But this is a rule of thumb for a good reason: if you're a photographer then you'll appreciate the greater sharpness of a 27in 4K screen. Likewise if you're a spreadsheet junkie who wants to cram as much data into view as possible.

Our third and final rule (for now) is that wider aspect ratios give you more room to work. If you switch from the 16:9 aspect ratio of a typical screen you'll notice how much space there is to spread windows when you move to a 21:9 aspect ratio. That's particularly useful for people who tend to have a central window and then use the rest of their desktop space as locations for reference information.

One more thing: eyesight comes into play here. If you struggle to see the screen at normal viewing distances then you may find yourself increasing the dots per inch beyond Windows' recommended settings. If you find yourself doing this, you'll appreciate higher ppi panels.

Colour palettes

Monitor manufacturers often talk about coverage of colour spaces. Most often, they'll focus on sRGB coverage. This is a conservative colour space created at the birth of the internet to ensure that when someone created a graphic they would have a good idea that the colours would appear accurately on people's monitors.

ABOVE Go for a larger screen if you like to have lots of windows open on your desktop.

Larger is generally better – but only if the number of pixels per square inch, the pixel density, remains above a certain level

BELOW Portable monitors are usually smaller than Asus' 24in ZenScreen MB249C.

ASUS ZenScreen
ASUS

Sometimes you'll see a quote for NTSC colour coverage, and that dates all the way back to early colour TVs.

The IT industry later developed colour spaces such as Adobe RGB, DCI-P3 and Display P3. Adobe RGB is only of importance to those who work in print and need to know that what they see on the screen will match with what they send to a professional printer. DCI-P3 emerged with digital cinema and is the standard with which Hollywood studios work. And Display P3 is an Apple variant of DCI-P3 designed to produce better results on computer displays.

What matters to most buyers is that they see pleasant colours. Anything below 60% of sRGB will look dull, with increasing richness until you get to 100% – and beyond, as a monitor can show colours that stretch beyond any single colour space. If you want vivid colours, look for a monitor that quotes 80% or above for the DCI-P3 space.

Contrast & colour accuracy

Five years ago you could make a buying decision based on high levels of contrast and the promise of a Delta E below 2 (Delta E is a measure of accuracy, with anything under 1 considered perfect). They were both good proxies for quality. These days, they are far less relevant as almost every monitor you will ever buy has a contrast ratio of 1,000:1 or above and an average Delta E below two.

But going back to our rules of thumb, if you see an IPS monitor with a contrast ratio of 2,000:1 then it will likely produce impactful images.

Bits and HDR

Scan the "Colour depth" line in our feature table and you'll see that they range from 6-bit to 10-bit panels, and as you would expect more bits equals greater colour coverage. And a higher price.

A 6-bit panel covers 262,144 colours, but that's not enough for modern tastes. That's why every 6-bit panel here adds a technology called frame rate control, or FRC. Also known as "temporal dithering", FRC alternates between different colour shades to simulate the desired shade.

FRC is so effective that few would be able to tell between a 6-bit + FRC panel and a true 8-bit panel, and they can both claim to cover 16.8 million colours (16,777,216, or 256^3, to be precise). Many manufacturers also employ FRC to boost their 8-bit panels to 1.07 billion colours ($1{,}024^3$). This matches the range of colours provided by 10-bit panels.

You will also see that some manufacturers list their monitors as "HDR-ready" or supporting HDR10. However, neither is a true indication that you'll enjoy HDR films and video with the impact you might hope, and even those that have gained DisplayHDR 400 certification won't blast you away. If this really matters to you, look for DisplayHDR 600 or even DisplayHDR 1000 certification, but these are only available on expensive panels, usually ones using OLED or micro-LED technology, as described below.

Types of panel

This group test reflects the type of panels you will generally find when looking for a monitor. All the monitors here use either in-plane switching (IPS) or vertical alignment (VA) panels (sometimes referred to as multiple vertical alignment, or MVA). IPS panels tend to give cleaner whites so are often favoured for business use, while VA panels tend to offer greater contrast and lower response times. They're also easier to use in curved monitors.

You'll sometimes see OLED and micro-LED panels, particularly in gaming monitors (which are outside the scope of this Labs). Where IPS and VA panels use a number of LED backlights that shine through to provide illumination, every pixel in an OLED and micro-LED panel has its own source of light. Thus they can each be switched off, to give the distinctive inky black that you won't find on standard displays.

Curved vs straight

Some people swear by curved monitors, especially gamers, as it helps them feel more immersed in games. Even more so if you opt for a setup with two, or even three, curved monitors. You'll see that all five of our curved monitors this month have a 1500R rating, which means that if they formed a circle around you the radius would be 1,500cm – so, one-and-a-half metres.

ABOVE Curved monitors are often favoured by gamers.

Refresh rates and response times

Another big change in recent years is the move to faster vertical refresh rates. This used to be 60Hz, and some monitors still are, which is fine for everyday use. However, the shift to 100Hz and 120Hz means a slightly more "solid" image that you may notice when browsing through documents or websites. It also helps in gaming, although with specialist gaming monitors the speeds now hit 240Hz and beyond, to match the frames per second generated by high-end graphics cards.

IPS panels tend to give cleaner whites, while VA panels tend to offer greater contrast and lower response times

To avoid tearing in games – that glitch where you pan across and the scene seems to jump – you should look for support for adaptive sync technology. This aims to perfectly synchronise the output from the graphics card to what appears on your screen. Many manufacturers use their own technology, but AMD also provides its FreeSync technology for free and charges for FreeSync Premium (which helps at lower frame rates, for instance).

BELOW A flexible stand is crucial both for productivity and your posture.

Finally, look for low response times. For most gamers, 5ms grey-to-grey is fine, but gaming monitors will go far lower.

Flexible choices

Every monitor in this group test includes a height-adjustable stand. And we feel such a stand is now crucial so that you can put the monitor at exactly the right height (the top of the screen should be at eye level, or slightly below, so that you're not craning your neck).

You'll never regret having a flexible stand, so look for the capability to pivot it through 90° and have the ability to tilt a generous amount. Eizo wins here, with both of its monitors providing a superb 35° backwards tilt compared to the typical 20° to 25°.

Having a VESA mount slot means that you can buy an arm or wall mount.

Look at the warranty

People often skirt over the warranty when buying electronic goods, and that's fine if things don't go wrong. If something does happen, though, you will be extremely pleased to have paid a little more for a monitor with an on-site exchange warranty, as the company will swoop in, remove your faulty display and replace it with a working unit. Most monitors include a "limited" warranty where they will arrange collection and attempt to repair it, usually within 14 days.

Fortunately, monitors are among the most reliable equipment around, and if it's all working properly out of the box when you first unpack it, you're almost certainly looking good for several years of trouble-free use .

Sustainability questions

Then we come to sustainability. Monitors are not a product that you will be able to repair yourself, so we're looking for circularity (how easy it is to reuse components at end of life), recyclability and the environmental cost of building and shipping each monitor.

Naturally, we have to rely on the companies' own environmental claims (for example, use of post-consumer recycled plastic) and third parties for this. While imperfect, EPEAT is the best proxy we've found, as it examines supply chains for the parts used in manufacturing and delivers a wider verdict on each company's actions. This is summarised in the EPEAT rating on the feature table.

One final word: a product that is thrown away after three years is far less sustainable than one that delivers great results for ten years. This is one reason why we will recommend Eizo monitors, for instance, despite their high initial price.

One last thing

There's only one way to truly see how good a panel is, however, and that's to read independent tests such as *APC*'s!

AOC 24B3HA2

The cheapest monitor on test, but this 24in USB-C Full HD display is a great choice if the size is right.

★★★★☆

PRICE $119
from aoc.com

This 24in Full HD monitor couldn't be any more different to most of the higher-end screens in this Labs if it came in neon green and spoke Russian. It's basic, it's small, it's cheap – and while it was never going to vie for awards there are plenty of factors in its favour.

Most important of all, the AOC 24B3HA2's image quality is far better than you might expect for the price. Stick to the native colour mode and this 1,920 x 1,080 panel covers a respectable 71% of the DCI-P3 gamut, which compares well to many budget monitors we've seen. Colours don't exactly pop, but nor is it dull.

There's also an sRGB mode, which locks well to that gamut and means whites appear a shade whiter. With solid colour accuracy, the only area where we would have liked more, to heavily paraphrase Oliver Twist, is brightness. Still, a 277cd/m² peak is fine unless you plan to place the 24B3CF2 next to a window that catches the sun. It's easy to tweak such settings using the OSD, which responds quickly to presses via the four shortcut buttons tucked away on the bottom right of the fascia.

The plus side of the minimal electronics – complex systems are needed to control sophisticated screens – is minimal power draw, with only the Eizo EV2410R more parsimonious in this test. But where Eizo eschews USB-C, AOC makes it one of this monitor's key features, with the USB-C port capable of delivering 65W to a connected laptop. Mind you, that's all you'll find at this monitor's rear other than an HDMI input and two tightly squeezed USB-A ports.

ABOVE Image quality is far better than you'd expect for the price.

We've seen cheap monitors with exceptionally basic stands before, where you felt a well-timed breath would push them over, but not so here. AOC provides a sturdy base complete with 110mm of height adjustment, and even though the stand doesn't offer any swivel the 24B3HA2 is manoeuvrable via the simple virtue of being so light: at 4.6kg, it's even lighter than the portable Asus ZenScreen (with its stand) below.

There are two final pleasant surprises. One is that this panel goes up to 100Hz and supports adaptive sync, so gaming is on the after-hours menu. The second is that it includes a pair of speakers. True, they're pretty dreadful, but it's still handy to have the option for sound on occasion.

You're getting what you pay for here, so no luxuries. Nevertheless, if all you need is a compact 24in monitor that supports USB-C and you're on a tight budget, then AOC makes all the right cuts in all the right places.

Asus ZenScreen MB249C

A portable 24in monitor that's a big step up from its 15.6in siblings and can lead a double life as a desk screen.

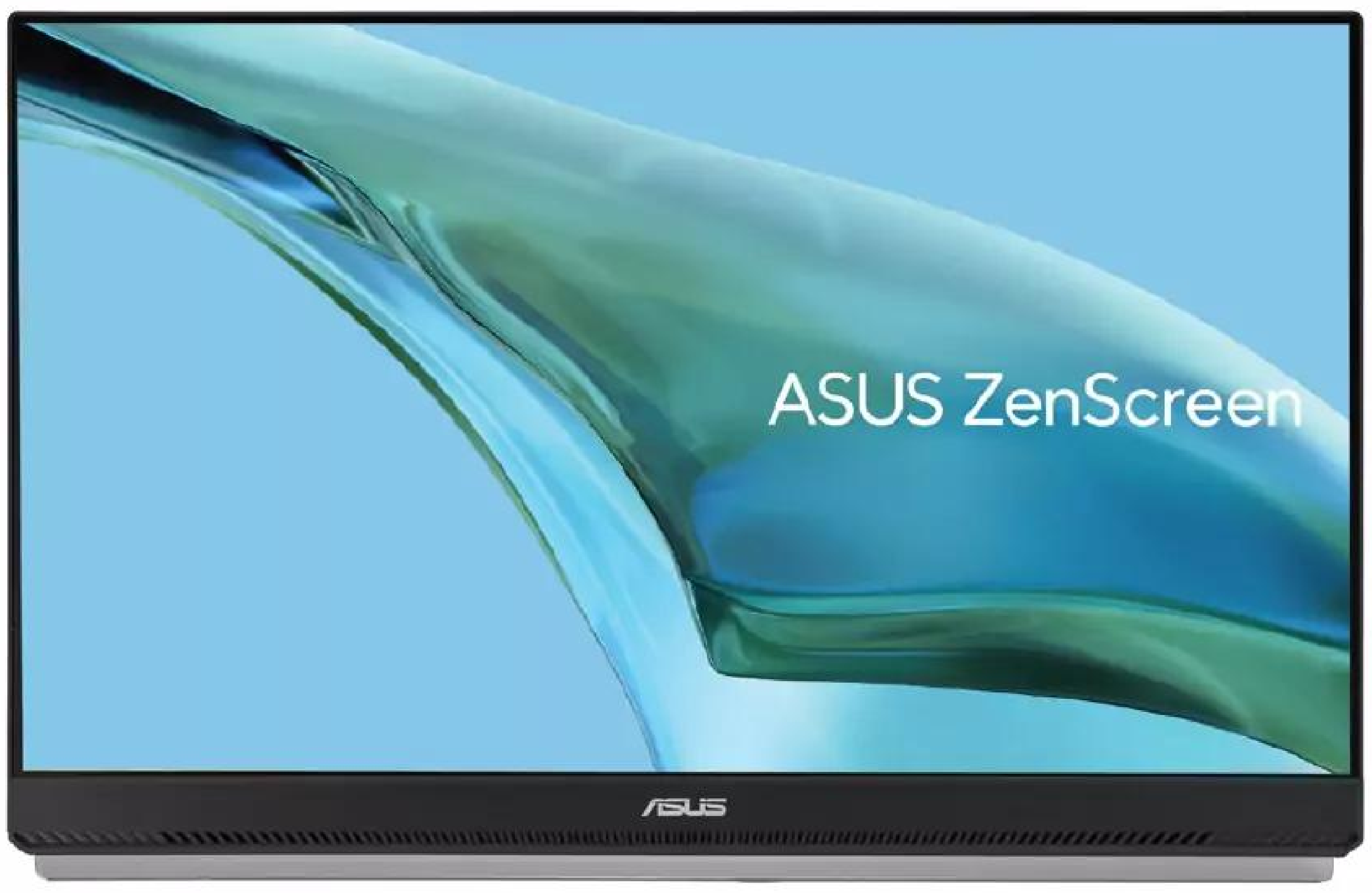
★★★★☆

PRICE $787 from asus.com

There's one problem with most portable monitors: they're just as small as the screen on the laptop they aim to complement. Asus solves that dilemma with a comparatively giant 24in monitor that you can stuff into a suitcase for travel as it only weighs 2.9kg. That doesn't include the stand or any screen protection, however, and don't forget to pack the compact 90W AC adapter.

Spreading 1,920 x 1,080 pixels over a 23.8in diagonal results in a 93ppi pixel density so text isn't ultra-sharp. However, it's so much easier to work on two windows side by side with a monitor such as this than a 15.6in panel, so if you chuck in a keyboard and mouse you should be able to reach similar levels of productivity in, say, a hotel room as you do at home. And not be so tired from squinting after an hour's work. All that said, we still yearned for 2,560 x 1,440 pixels.

Image quality is surprisingly good, with the ZenScreen's average Delta E of 0.7 reflecting its excellent colour accuracy. Just don't expect colours to whack you between the eyes with their vibrancy. This is essentially an sRGB display, covering around 90% of that space and 78% of the DCI-P3 gamut. Asus makes it easy to jump between colour profiles using the button-operated OSD, so we ended up working in the Standard space, where whites look good – albeit not perfect – and Game mode, where we felt streaming services looked their best. There's a solid pair of speakers built in, but with little bass and dominant trebles we didn't love it when listening to music.



ABOVE The ZenScreen is an ideal solution for workers on the move.

Asus provides interesting mounting options. On your travels, you'll likely rely on the built-in kickstand, but there's also an option for hanging it over partition walls (in shared office situations) or on a clamp arm. The latter wasn't available for testing, despite being bundled with retail units, but it looks a great option for use at home – push the screen right back (up to 144mm) when you don't need it, bring it close when you do. The arm also brings screen rotation as an option and offers up to 180mm of height adjustment. The screen detaches quickly, too.

There's less flexibility when it comes to video inputs, with only USB-C and HDMI on offer. Connect over USB-C and it can charge your laptop at the same time, with 60W of power up for grabs.

While we would have liked a higher resolution, the MB249C is a creative solution to a problem that besets many workers on the move. Considering that it can then also double as a second monitor at home or in an office, we think it's worth the asking price.

Eizo FlexScan EV2410R

A basic 24in display with backwards compatibility in mind, so only consider it for those edge cases.

★★★★☆

PRICE $687
from eizoglobal.com

The Eizo FlexScan EV2410R stands out from the 24in crowd – admittedly a thinning crowd due to the dominance of 27in screens – thanks to its 16:10 aspect ratio and array of ports. Eizo opts for old-style DVI-D and VGA connectors to keep the HDMI and DisplayPort inputs company, which is a calculated move: this monitor is designed for environments such as healthcare and education that rely on equipment using these old standards.

There's no USB-C input, but there is a USB-B port along with four USB-A ports: two sit at the back, the other two on the left-hand side for easy access. You'll also find a 3.5mm headphone jack along with a line out, and although it's always good to see built-in speakers the weedy pair here are for emergency use only.

There's every chance this monitor will be running 24/7, and with a 10W draw at 200cd/m² it's the most efficient display on test. It's backed by Eizo's generous five-year warranty, with the promise of no bright sub-pixels for the first six months, and as always with Eizo monitors it feels solid. Almost too solid: we had to pull the display forward with some force to move it within its wide -5°/35° tilt range. By contrast it's incredibly easy to swivel, rotating the full 360°, which reflects the likely usage of this monitor – atop a trolley, say, or tucked into a server room – where people might use it from any angle.

ABOVE The FlexScan EV2410R is designed for a niche market.

The medical colour space DICOM is one of six you can choose from the excellent touch-sensitive OSD: tap the bottom right bezel and two user-definable spaces appear, along with sRGB, Paper (sepia) and Movie. The intuitive, responsive OSD provides an object lesson in how to making it easy to change options.

It's ironic, then, that there's so little to change; when we jumped from default to the sRGB colour space it barely altered the measured gamut, namely 99% sRGB and 80% DCI-P3. There are also two EcoView settings, but you'll want to switch off Auto EcoView or forever be stuck at a ridiculously low brightness. The EcoView Optimizer 2 is more useful, as the screen remains easy to read despite lowering the brightness of the backlight in tandem with increasing the gain. However, with this switched on colour accuracy drops, with its average Delta E moving from its 0.41 norm to 6.92.

It's unfair to compare the Eizo to rivals here as this isn't a mainstream monitor. On top of that it's in and out of the Australian market so availability might be a challenge at times.

Time to dock

USB-C ports are now ubiquitous, but that alone doesn't make a docking monitor

There was a time when you could stick a USB-C port onto a monitor, throw in a couple of USB-A ports, and consider the docking box ticked. So long as the USB-C port could feed enough power into the laptop – and 65W is plenty for most – surely punters had everything they needed: plug in the laptop with a single USB-C cable when at the desk, unplug it when it's time to leave.

But as this Labs shows, several manufacturers have upped the ante. Part of that comes from the available power on offer, with many USB-C ports now capable of delivering 90W to 100W. That's enough to feed a MacBook Pro and even some gaming/creative laptops. The next big tick to look for is wired networking, with ten monitors here including RJ45 ports. One even supports 2.5GbE networking. With no space on most laptops for an RJ45 port, a modern docking monitor is an excellent way to bring this more reliable form of connectivity to your setup.

If you want to connect a second computer, especially if it's a desktop PC, then look out for USB-B inputs, too. This standard is almost 30 years old, but it remains the most common method of providing access to the connectivity (USB-A ports, USB-C ports, wired networking) provided by these most modern of monitors.

Some manufacturers go one step beyond connectivity by including webcams. These vary in quality, but make a lot of sense in the post-Covid working culture of endless Zoom and Teams calls. How much neater to have everything built into the monitor, including the microphone.

ABOVE Modern monitors have turned into super-powered docking stations.

That brings us to the final audio ingredient: speakers. Again, it isn't enough to check that these come with the monitor, as some are high-fidelity units while others sound like people relaying messages via a tin can. But choose the right monitor and you can cut the clutter on your desk to zero.

All of which means that our advice to a prospective monitor buyer is to consider your options carefully, as you're now buying into a complete communications hub. Make sure you know what you're buying, and what you might be missing out on.

Acer Vero CB272K

Starting to show its age in terms of connectivity, but still a high-quality 4K screen for a competitive price.

★★★★☆

PRICE $491
from acer.com

apc
HIGHLY RECOMMENDED

We need to tackle this monitor's great weakness from the start: it doesn't include a USB-C input. You're stuck with one DisplayPort and two HDMI ports, and no fancy luxuries such as USB hubs or RJ45 networking. All of which makes this sound like a bottom-of-the-pile, budget 27in monitor, but as soon as you switch it on you'll discover that this is far from the case.

First of all, let's talk about the clarity of the Vero CB272K's whites. Choose the sRGB mode and it locks down near perfectly, marrying 95% coverage with 95% of volume. That means every colour you see falls in the sRGB gamut. With strong colour accuracy to back this up, you can trust what you see. You won't get the sheer breadth of colours offered by more expensive panels such as the ViewSonic VP2788-5K, but photos and films still look strong if you switch to the Standard or Movie mode. It helps that brightness pumps all the way up to 420cd/m² (70cd/m² higher than Acer's stated brightness).

With no data connection back to a host computer, you're reliant on the on-screen display (OSD) to control the settings. Acer provides a simple trio of buttons on the back right of the monitor to navigate through the options, with handy shortcuts for switching between inputs, adjusting brightness and jumping between colour modes (avoid the top button as this is the power switch, which we hit a few times by accident). There's also a joystick if you want to explore the panel's more advanced options.

Fundamentally, however, you're fiddling at the edges. No amount of tweaking is going to change this panel's refresh rate of 60Hz, for example, so while it's good to see support for AMD FreeSync we would not recommend this panel to gamers. It does make a passable choice for TV streaming services, though, with a pair of 2W speakers that are just good enough for soundtracks – and just not-quite-good-enough for music.

But that's fine, because this monitor falls neatly into the "work" category. That's where a 4K resolution, strong colour accuracy and the stand's excellent mobility – it pivots, tilts back 35°, swivels almost 360° and provides a tremendous 165mm of height adjustment – can make a real difference. And if you catch the sales, you might find it for less, as we did during our test period. At that price, despite its lack of a USB-C input, the Acer Vero CB272K becomes a bargain.

ABOVE Strong colour accuracy makes the CB272K a 4K bargain.

BenQ GW2790QT

Not the most exciting monitor on test, but it meets all key criteria at an aggressive price.

★★★★☆

PRICE $459
from benq.com

BenQ
apc
HIGHLY RECOMMENDED

Unlike the glamorous BenQ DesignVue PD2730S, the GW2790QT is targeted at office users. That means a much less expansive colour gamut, one that's essentially tied to the sRGB colour space – so don't expect vivid imagery. The colours that you do see are accurate, however, with an excellent average Delta E of 0.41. It's also sharp, with the 2,560 x 1,440 pixels a great fit for a 27in diagonal.

BenQ's intuitive OSD is easy to navigate using the joystick, with a selection of Color Modes to jump between: Standard, Coding, Care Mode, Movie, Game, ePaper (sepia) and User. Using the latter you can tweak the colour temperature, and we found doing this produced a cleaner white than default – it's so easy to do you might as well tweak it yourself.

It's also worth exploring the Eye Care menu, with a built-in "Business Intelligence" sensor that adjusts brightness depending on the levels of ambient light. BenQ's "Color Weakness" mode allows you to adjust the intensity of greens and reds. Both these features, together with the option of reminders about looking at the screen for too long, widen the GW2790QT's office appeal.

While BenQ doesn't include a webcam it does provide a microphone, which you activate via a button on the bottom of the bezel. A white LED handily appears to show that it's active, and while the mic is far from podcast quality it's fine for web calls. There's even a noise filter if you need to block out office hubbub.

The mic only works if you connect using the USB-C port, which delivers a relatively modest 65W of power to connected laptops, but there are also DisplayPort and HDMI inputs. A second DisplayPort sits ready for daisy chaining so, similarly to the Iiyama ProLite XUB2797QSN, you can have a twin-display setup for around $900. Unlike that monitor, however, there's no RJ45 for wired networking. What you do get is a USB hub, with two extremely awkwardly placed USB-A ports at the rear – one hampered by being so close to an edge – but the other USB-A connector is kept company by a USB-C port on the bottom of the panel's bezel.

We've seen more flexible stands than this, with 110mm of height adjustment and a slightly stingy 20° swivel from left to right, but it does support portrait mode (like every other sub-32in monitor here), and BenQ also wins for the quality of its speakers. They're actually good enough to enjoy music. If that's more important to you than wired networking, the GW2790QT makes a fine alternative to the Iiyama.

ABOVE A sharp and colour-accurate display at a good price.

Dell 27 Plus 4K USB-C

Others offer better value, but this is a great choice if you're after a compact and stylish 4K monitor.

★★★★☆

PRICE $379 from dell.com

Take care if you choose this monitor: it comes with three different resolution panels (Full HD, QHD or the tested 4K), and you can select each with or without USB-C. The price changes – but the looks stay the same, with a chic design distinguished by ultra-slim bezels and a matt white stand. It's definitely one of the most stylish monitors around.

Dell takes the unusual step of hiding away the USB hub, which consists of a USB-A and USB-C port in a pop-down unit at the bottom left of the bezel. It's neat, until you plug cables in and they remain visible. A second USB-A port sits in a cavity at the rear, which is also where you'll find one of the two HDMI 2.1 outputs. A panel covers up this cavity to keep things looking pretty, with a cable tidy at the rear of the stand for the USB-C cable and power cable; both plug into the rear of the unit with no secret cavities to hide them.

apc
HIGHLY RECOMMENDED

It's a flexible setup thanks to 130mm of height adjustment, respectable amounts of tilt and swivel, plus support for portrait mode. You'll also appreciate Dell's solid build quality, with the only negative being the plasticky nature of the pop-down USB hub.

This isn't a monitor for creatives due to the panel's limited palette: in its default mode it covered 81% of the DCI-P3 space, which is punchy, but it's in sRGB mode where this panel excels: it covered 97% of the gamut with a 99% volume, and that means you can trust what it displays (its average Delta E of 0.6 reflects strong colour accuracy). Whites look fantastic, too. Dell states a maximum brightness of 350cd/m², but we measured 388cd/m².

ABOVE Dell's stylish 27 Plus 4K is flexible and well-built.

You can take control of the settings via Dell's neat and responsive menu, controlled by a joystick, while Dell Display and Peripheral Manager is on hand for those who prefer software. There are a few preset modes to switch between, plus one custom option, and if you want to play games then it's worth switching into, say, FPS as this will increase the grey-to-grey response time to 4ms. Also note the support for AMD FreeSync Premium, while 120Hz refresh rates will help to ensure on-screen action looks slick.

Those who listen to music while they work, or want to watch films, will also appreciate the powerful and well-balanced 5W speakers. Bass doesn't exactly boom, but most people will be happy with the output.

Happy enough to pay $379? Yes, simply due to the all-round quality, but no-one is going to claim that this is a bargain buy.

Eizo FlexScan EV2740X

This top-quality panel is backed with every feature you'll need and the best warranty around.

★★★★☆

PRICE $1,700 from eizo.com

Eizo describes the EV2740X as "premium 4K for business", and we can't think of a better set of words to describe it. This monitor is designed to be rolled out en masse so that users can plug it in and enjoy top-quality images while admin teams can manage them from afar.

That's possible thanks to a built-in RJ45 connector and the Screen InStyle software, which gives IT control over energy usage – by forcing the monitor into Eco Mode – and colour profiles. That may seem draconian, but if this is a shared monitor you want everyone to plug into it and enjoy what they see.

And enjoy it they will. Anyone who spends most of their time in Excel or Word will love the clean whites: no monitor on test came closer to the 6500K ideal colour temperature, with 6503K in its default mode. A contrast ratio of almost 2,000:1 helps. It's colour accurate, too, thanks to an average Delta E of 0.27 and 84% coverage of the DCI-P3 gamut.

apc
HIGHLY RECOMMENDED

That's in default mode, with two user-definable profiles to accompany sRGB, Paper, Movie and DICOM. The first locks it effectively to the sRGB colour space, Paper provides an eye-friendly sepia mode for reading, Movie frankly makes very little difference whatsoever, and DICOM is there for medical environments.

ABOVE A high-quality display that's perfect for business rollouts.

It's easy to switch between them using the touch-sensitive OSD: tap the bottom right of the bezel and relevant options appear, including shortcuts to control the brightness and volume, activate the full OSD and switch between the inputs. Here, Eizo spoils you: not only is there USB-C, but two HDMI connectors, a DisplayPort and a USB-B input if you wish to connect a second PC and share the Ethernet connection and USB ports. There are two USB-A ports at the rear, with one more on the left-hand side along with USB-C, line in and line out. There's even a fine pair of speakers.

The superb stand is one of the most robust here, with no hint of a wobble, while you can twist, pivot and rotate the panel to an extensive degree. Add a height adjustment of up to 195mm – the highest here – and you simply won't find a more user-friendly setup.

The drawback of all this quality is that you have to pay for it. And make no mistake that you are paying a premium, even when you consider the excellent five-year warranty with the promise of no bright sub-pixels for the first six months. The counter-argument is that this monitor should last for many years, well beyond the warranty, thanks to an element of over-engineering that's also reflected in the price.

HP Series 5 Pro 527pq

It may seem overpriced in this company, but you're rewarded with rich colours and excellent video skills.

★★★★☆

PRICE $399 from hp.com

While it's highly subjective, the HP Series 5 Pro 527pq earns our prize as the best-looking 27in display on test, with slim bezels matched to a minimalist matte silver stand. It's maxi when it comes to movement, though, with pivot support, 150mm of height adjustment and the ability to swivel 45° both left and right.

Cable management is easier than most as they plug in horizontally rather than vertically, which avoids cables dropping below the screen; it's further helped by a neat cable tidy that sits hidden behind the slim rod of the stand. There's no shortage of potential wires thanks to an RJ45 port, USB-B port and a trio of video inputs: USB-C (feeding up to 100W of power), HDMI and DisplayPort. There's also a DisplayPort output for those wishing to daisy-chain a second screen.

apc HIGHLY RECOMMENDED

Naturally HP provides a USB hub for connecting peripherals, with a trio of USB-A ports and a USB-C port that can charge at up to 15W. Two of those USB-A ports sit at the bottom of the panel's bezel, along with a 3.5mm jack, while a clever and intuitive multi-directional button at the rear gives control over settings. Or you can use HP's Display Center software.

In terms of the panel's gamut, you don't have much to play with. There's some wiggle room over colour temperature, and HP's Enhance+ effect for sharpening, but HP clearly has confidence that the out-of-the-box settings work – and it's right. Whites look gorgeous, and unlike so many of the 27in IPS panels on test this month it covers almost 90% of the DCI-P3 colour gamut. If all the other panels deserve grade A status, this one is A+. HP also deserves recognition for gaining EPEAT Gold certification with Climate+ for this monitor.

ABOVE This monitor screams quality from every angle.

Finally we come to the video-conferencing setup that gives this monitor its full name (the HP Series 5 Pro 27 inch QHD USB-C Conferencing Monitor). The pop-up, tiltable 1440p webcam is the star, providing plenty of detail and rich colours even in darker conditions, but its supporting cast of microphone and speakers are excellent, too. This is one of the few monitors on test we'd be genuinely happy to listen to music through.

Is the Series 5 Pro worth the 50% premium over the Iiyama? Perhaps not: the jump in quality and feature set isn't that significant. Nor can we ignore that the Dell 27 Plus 4K USB-C offers a higher-resolution screen for less, albeit without video-conferencing skills. But sometimes it's not about what you could buy and what you do buy; and if that ends up being the HP Series 5 Pro 527pm, you won't be disappointed.

Iiyama ProLite XUB2797QSN

Yet another great-value monitor from Iiyama and one that begs the question: why pay more?

★★★★☆

PRICE $504
from iiyama.com

It shouldn't surprise us to see a high-quality yet superb-value Iiyama monitor, because that's what the company has produced for years. Here it delivers a 27in QHD (2,560 x 1,440) display based on a lily-white IPS panel. Although anyone hoping for wide colour gamuts should look elsewhere: it covers 77% of the DCI-P3 space compared to 97% of the ViewSonic VP2788-5K, to take an expensive example, and that means you miss out on lush hues in scenery.

The Iiyama display performed excellently in our colour accuracy tests, however, and its peak brightness of 317cd/m^2 is more than enough for office locations. We found it usable at half that brightness.

apc HIGHLY RECOMMENDED

In terms of features, it's quicker to cover what the XUB2797QSN doesn't include. First, there's no USB-B port, which remains you miss out on a handy way to share peripherals plugged into the USB hub: a trio of USB-A ports and single USB-C port. These all sit at the rear, but are still easy to access as it's a flexible stand that can pivot 90°, rotate 45° in either direction and tilt back 23°. The second omission is a high-quality pair of speakers; the 2W units here are clearly geared towards voice rather than percussion, so choose the BenQ GW2790QT if that's important to you.

ABOVE It looks basic next to the HP, but boy does it win for value.

Now let's cover what you do get. First up, wired networking, which makes this a true USB-C docking monitor (*see "Time to dock", p81*). The USB-C port also delivers a generous 96W of power, enough to feed even demanding laptops, and there's support for daisy chaining via a DisplayPort out. Buy two of these monitors and you can have a killer setup for around $1,000.

Nor does Iiyama stint on video inputs, with two HDMI 2.0 connectors and one DisplayPort input. If you use any of these along with the USB-C connection then you can share an attached keyboard and mouse, but that will involve heading into the OSD and manually activating the KVM switch. A pain, as this isn't the friendliest of OSDs to use.

So there are signs of this monitor's low price in daily use, but once you factor in Iiyama's five-year warranty and proven track record for reliability, not to mention the gaming potential thanks to the panel's peak 100Hz refresh rate and support for adaptive sync, the Iiyama ProLite XUB2797QSN stands out as one of this month's bargains.

MSI Pro MP275QPDG

Cheap enough that you can buy two – and daisy-chain them – for a fantastic setup, but colours needs tweaking.

★★★★☆

PRICE $479
from msi.com

apc
HIGHLY RECOMMENDED
MSI

The MSI brand springs to mind when thinking about graphics cards and motherboards, but it has a long history of producing displays, too. And not just gaming offerings: we've been impressed by MSI's business-focused range before, and this is yet another solid performer.

We say solid rather than outstanding because the 27in 2,560 x 1,440 panel has modest colour coverage, with 73% of the DCI-P3 gamut within its range. That means colours lack the pop of the HP Series 5 Pro 527pm, say, so anyone hoping to be entertained should look elsewhere. Instead, think of this as a work-focused panel. We suggest you play around with the colour temperature, however, with whites not looking their best in sRGB mode due to a cool-ish 6090K colour temperature. We spent several minutes adjusting the colour temperature, when that should have been sorted out of the box.

The joystick-controlled OSD works well for such tweaks, but we found it easier to switch to the Productivity Intelligence app (even if this prompted us to connect the USB-B connection, despite already being connected over USB-C). It's clunky but provides enhanced control over every setting, so is well worth investigating.

MSI provides a generous selection of inputs, with two HDMI connectors and one DisplayPort. That's alongside the USB-C port, capable of delivering up to 98W of power to laptops (or one of MSI's Cubi mini PCs), and it's always good to see an RJ45 connector at the rear alongside the aforementioned USB-B connector and four USB-A ports.

It's a shame MSI couldn't move two of these to the side for easier access, but there's enough backwards tilt (20°), swivel (45°) and height adjustment (130mm) to manoeuvre it and plug in your keyboard and mouse. You won't need to add a webcam as MSI packs a 1080p unit here, and despite this monitor's competitive price it's a high-quality device that coped in low light and produced sharp images with a nice range of colours. With an effective integrated mic and decent pair of 2W speakers – good enough for listening to music at low volumes, but far from Echo standards – every important base is covered for a home office. We think SMEs should also seriously consider it for a small office rollout, but note that you'll need to screw the backplate in: there's no tool-free option.

With support for daisy chaining a second monitor using the DisplayPort output, MSI packs in a lot for your money. To the point where you might consider buying two.

ABOVE The styling is basic, but we do love the 1080p webcam.

ViewSonic ColorPro VP2788-5K

This 5K Thunderbolt monitor packs OLED-like intensity and amazing connectivity – for a price.

★★★★☆

PRICE $1,579
from viewsonic.com

ViewSonic | ColorPro
27"
apc
HIGHLY RECOMMENDED
DCI-P3
THUNDERBOLT.
ViewSonic

If we gave awards on the basis of features alone, this display would walk away with a cabinet's worth. The two Thunderbolt 4 ports mean you can daisy-chain two together and view a staggering number of pixels in a compact area: imagine having two 5,120 x 2,880 screens side by side. The second panel will require its own power supply, though, as the "down stream" port can only feed up to 15W.

The VP2788-5K includes a separate power brick, and it's meaty at 230W. Still, with up to 100W of that feeding a connected laptop and 15W going to a separate USB-C port, you can see how the power is used up. There are also HDMI and DisplayPort inputs at the rear, and if you connect a second computer via USB-C you can share connected peripherals between the two: a pair of USB-A ports and fourth USB-C port are all ready to be shared.

A 5K resolution is unusual for a 27in monitor – only the BenQ DesignVue PD2730S matches it in this Labs – and results in a super-sharp pixel density. You could argue it's overkill, but if your eyesight is good it will make it easier to split three windows across the screen – and unlike the 32in and 34in widescreens on test, the VP2788-5K doesn't take up much space on a desk.

It's a top-quality panel that's been fine-tuned by ViewSonic to deliver the goods no matter the colour space you prefer to work in. Choose sRGB and it locks almost perfectly (97% out of a 98% volume), likewise DCI-P3 (97% out of a 97% volume). Three presets sit empty if you want to perform your own hardware calibration. Those sit in the Color Mode menu, but ViewMode is based on scenarios; presets exist for everything from CAD to first-person-shooters, even if a 75Hz refresh rate rules out hardcore gamers. In general the OSD is a winner thanks to its snappy performance, but we lost count of the times we accidentally switched the monitor off as the power switch sits right next to the OSD's joystick.

Another potential pitfall is that Eco Mode is on by default, so you may wonder why a monitor with a stated peak brightness of 550cd/m^2 looks so dim. Switch off Eco Mode and your world will brighten, with a measured maximum of 566cd/m^2. We hoped for DisplayHDR certification of 600 or higher, but instead it's stuck at 400. Still, films look great on this panel (a contrast ratio approaching 2,000:1 helps), and it includes a fine pair of 5W speakers that handle soundtracks and music with equal aplomb.

All this comes at a price, unless you compare it to Apple's Studio Display: if you want the height-adjustable stand to match the VP2788-5K's flexible offering it will cost you a cool $2,499.

ABOVE A feature-packed monitor, but it comes at a price.

Asus ZenScreen Smart Monitor MS27UC

An intriguing choice for hybrid workers and students, even if image quality can't beat the best.

★★★★☆

PRICE $883
from asus.com

apc HIGHLY RECOMMENDED

The Asus ZenScreen MS27UC is part of a growing trend to inject streaming TV services into monitors, grouped under the hazy term "Smart Monitor". It's a boring name but a fascinating product category, because it appears to meet our changing habits: the office has moved to our homes, with different parts of people's accommodation doubling as a place of work during the day and somewhere to play at night. You can see why a monitor that can essentially double as a TV appeals in such scenarios, not to mention for students who spend so much time in their rooms.

Asus isn't alone in producing Smart Monitors, with both LG and Samsung established vendors in this space. Where it differs is by using Google TV as its operating system rather than LG's webOS (a direct descendant of Palm's webOS, which HP acquired in 2010 when it bought Palm and then sold on to LG in 2013) and Samsung's home-brewed Tizen OS.

LEFT You can store peripherals in the holder at the rear.

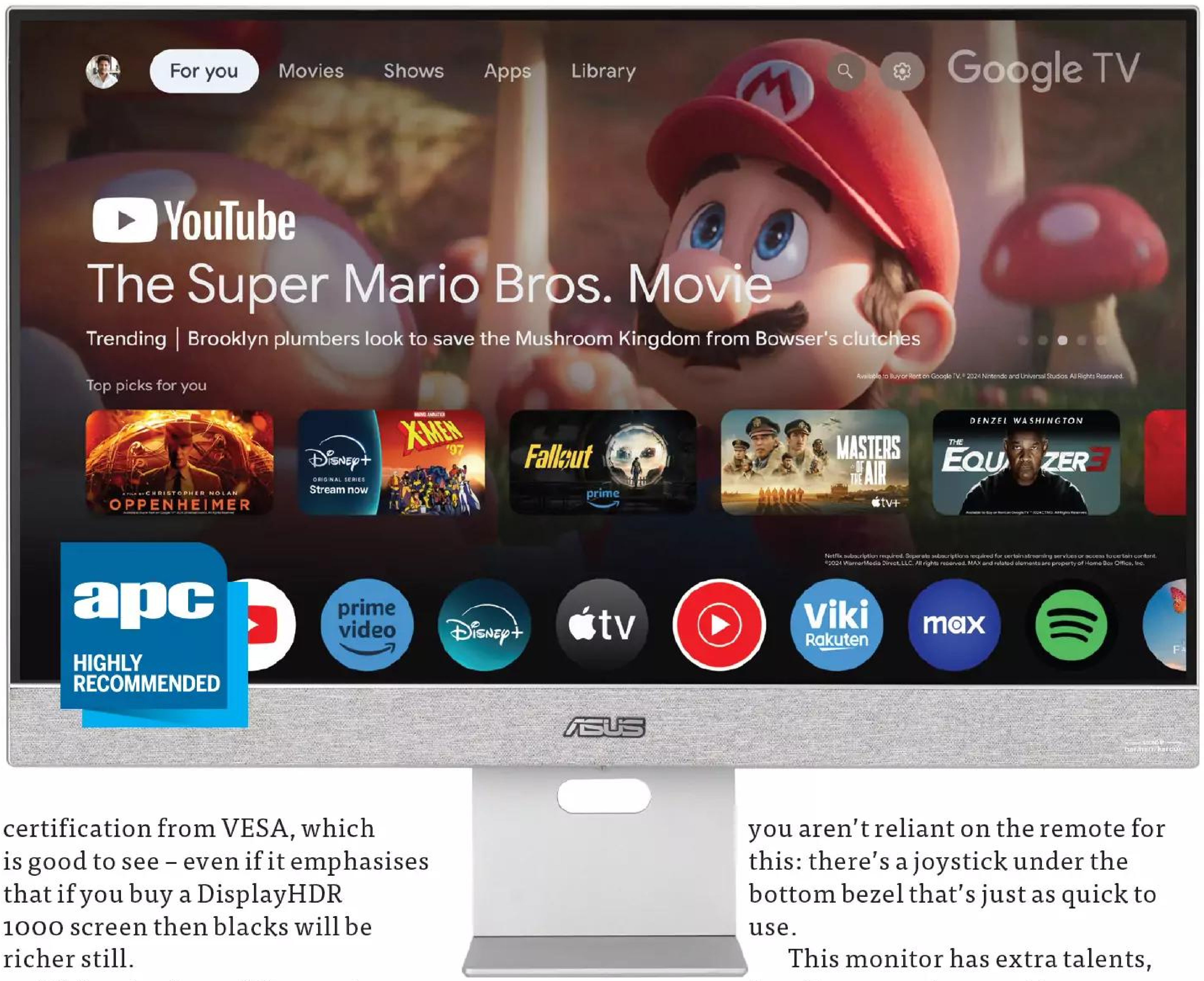
Your preferences may differ, but we like Google TV for its simplicity and speed. Press Home on the supplied remote control and you jump to the main interface, which provides easy access and all the services you've signed up to – including Apple, Disney+, Netflix and Prime Video – alongside TV channels.

Fortunately, you can easily stream to the ZenScreen from your phone using Google Cast, and when you load up a show the Smart Monitor delivers. IPS panels such as this will never match the pitch black of their OLED counterparts, but this didn't affect our enjoyment of, say, *Lost in Space*. Asus has also gained DisplayHDR 400 certification from VESA, which is good to see – even if it emphasises that if you buy a DisplayHDR 1000 screen then blacks will be richer still.

We're also fans of the speakers, a pair of 5W units built into the bottom of the screen. When sitting in front of the MS27UC you will be hit full blast by their power and fidelity, and whether watching films or listening to music we were happy. It's even capable of handling the subtleties of classical music.

Asus hands all control of the panel's image to Google TV, which means you don't have as much control over the colour palette as non-smart monitors. You can tweak the colour temperature and switch between sRGB, DCI-P3 and even Adobe RGB colour spaces, but this made minimal difference visually or when we measured them: you're stuck in what we would consider a slightly extended version of the sRGB space, equating to 78% of the DCI-P3 gamut.

As a daily monitor, its biggest plus is the 4K resolution. That means text looks sharp, even if you lean in closely, and helps when working on anything detailed. We were less impressed by the out-of-the-box settings for contrast and colour temperature, but found a workable setting after battling through the Google TV forest of menus and submenus. The good news is that you aren't reliant on the remote for this: there's a joystick under the bottom bezel that's just as quick to use.



ABOVE The ZenScreen will look right at home in any living room.

This monitor has extra talents, too. For example, smart home adopters will appreciate the ability to control smart heating, doorbells and the rest from this device. You can also activate Multi-View to share the screen between your PC and phone, and even set yourself entirely free from wires by using MiraCast or Chromecast.

We would always choose the lag-free options of direct inputs, however, and you have a choice of HDMI and DisplayPort alongside USB-C (delivering up to 90W). Two USB-A ports and a 3.5mm jack also sit at the rear, which is limited, but there is built-in Bluetooth for connecting a mouse and keyboard. And neatness freaks will also appreciate the holder for such peripherals that's integrated into the back of the monitor.

We wouldn't go so far as to call the ZenScreen a work of art – although it can display paintings in its Ambient Mode – but Asus deserves credit for this monitor's design. Everything is finished in smart silver, right down to the brutalist stand. There's a limited but still useful 100mm of height adjustment and 18° of backwards tilt, but no swivel. Fortunately it's quite light at 6kg.

Considering that the Dell 27 Plus 4K costs $504 less, Asus is bundling a lot of extras to justify the extra money. We wouldn't put the ZenScreen MS27UC into the same category of image quality as the Dell, especially for colour coverage, but its myriad other talents earn it a Recommended award.

OK
NETFLIX
YouTube
prime video
APPS
ASUS

BELOW The supplied remote offers access to streaming services.

BenQ DesignVue PD2730S

If you'll exploit its quality and its advanced features, this 5K panel is well worth the hefty investment.

★★★★★

PRICE $1,999
from benq.com

BenQ
apc
EDITOR'S CHOICE
apc
BEST ON TEST

ABOVE The BenQ DesignVue makes no compromises when it comes to image quality.

One monitor looms large in the background when reviewing the BenQ DesignVue PD2730S: the Apple Studio Display. They're both 5K screens, and both designed to complement Apple computers with Thunderbolt 4 outputs, but while the Studio Display costs $2,499 with the standard glass and stand – rising to $3,599 if you select the Nano-texture glass and height-adjustable stand – you can pick up the BenQ for a $2,000.

The great thing about this BenQ display is that, when it comes to image quality at least, you're making no compromises. It's pre-calibrated to hit the sRGB, Display P3 and DCI-P3 gamuts almost perfectly, along with matching the colour profile found on MacBooks (BenQ calls this M-book). It even comes with a licence for BenQ's Ultimate Palette calibration software, so you can fill one of the two user slots with your own favourite – this could be an Adobe Premiere video-editing profile, for example.

LEFT The Hotkey Puck G3 makes it easy to switch between the many colour profiles.

We put the DesignVue through an extra-comprehensive set of testing to see how it matched up to its various profiles, and were never disappointed. Its best result came in our sRGB gamut tests, where it locked to 94% of the space without any overspill, with DCI-P3 not far behind at 93%. And you can absolutely trust the colours you see, with its average Delta E always under 0.5.

BenQ states a peak brightness of 400cd/m^2, but that's only achievable if you head into the Advanced settings and switch Uniformity from on, its default, to off. In our tests, that changed its peak from 281cd/m^2 to 503cd/m^2 – quite a difference, although IPS panels at 250cd/m^2 still look fine in office environments. BenQ puts Uniformity on by default to smooth out the contrast and brightness across the panel, which we wouldn't normally recommend as contrast also drops as a result; here, though, it goes from 1,927:1 to 894:1, which is still a decent score. And BenQ's choice has a dramatic effect on the brightness uniformity too, with the average difference (of the 24 measured areas to the central area) dropping from 9.7% to 3.1%.

It's phenomenally easy to change the settings thanks to the wireless Hotkey Puck G3, which includes a dial and numerous shortcut buttons that can all be programmed. You can do this via the OSD, but we recommend downloading BenQ's slick Display Pilot 2 software, which makes such customisation more intuitive and sits ready in the taskbar. It's a shame that you can't upgrade the monitor firmware using this as well, but BenQ's Display Quickit utility does the job well enough.

This may all make using the DesignVue sound complicated, but it's worth investing the initial time to tune it to your needs as it can then be instructed to switch automatically between colour modes depending on the active software. You can also split the panel into two colour modes, one for each half. And there's more: connect over Thunderbolt 4 on a Mac and you can daisy-chain a second 5K Thunderbolt monitor through the output. BenQ also makes it easier than most to plug video input cables in, with the DisplayPort, HDMI and Thunderbolt 4 ports all lying in wait.

Perhaps surprisingly for the price, there's no RJ45 port – so this isn't an out-and-out docking monitor – but you do benefit from a USB hub comprising three USB-A ports and one USB-C, all of which sit at the bottom of the monitor for relatively easy pluggability. This is where you'll appreciate the 150mm of height adjustment, but it's a shame it doesn't tilt back further than 20°, while the 30° of swivel to either side isn't great for sharing your screen with neighbours. While we're nitpicking, we also hoped for more quality from the pair of 3W speakers, which lack bass and balance compared to the ViewSonic.

This reflects the two monitors' different strengths, with the ColorPro VP2788-5K being a better entertainer while the BenQ is a more natural choice for creative professionals. They're both excellent screens, and far cheaper than either the Apple Studio Display or Eizo's professional ColorEdge offerings.

BELOW Thunderbolt 4 sits at the ready for a single connection or daisy chaining.

Acer SH322QU

We can't criticise the price, but the low pixel density and limited features are hard to ignore.

★★★☆☆

PRICE $279
from acer.com

Acer is a proven master of delivering great-value products, and that's precisely what it achieves here: a 31.5in panel and USB-C connectivity for $280 is impossible to knock. And while others strip down the quality of the stand to achieve such a low price, the SH322QU provides a respectable 100mm of height adjustment and the ability to swivel 360°. The monitor even looks attractive, with slim bezels and housing.

Some of this svelteness is achieved by relying on a power brick rather than integrating the PSU, with the DC input sitting next to a grand total of four ports: one apiece for the audio jack, USB-C, DisplayPort and HDMI connectors. There's no USB hub, but you can at least charge a laptop over the USB-C port – so long as 65W is enough.

ABOVE The 31.5in screen is just too large for a QHD resolution.

But the real compromise is the pixel density. Spreading a QHD (2,560 x 1,440) resolution across a 31.5in diagonal results in 93 pixels per inch (ppi), and that means you might notice a jagged edge to characters. It's bearable, but most people prefer a ppi above 100. There's also a notable drop off in contrast as you look to the edges of the panel, which isn't unique to the SH322QU but was reinforced by its average uniformity of over 10%. Ideally, we're looking for 5% or less. Even in the centre, it didn't hit its claimed 300cd/m^2 in our tests, but a peak of 289cd/m^2 wasn't far off.

In terms of colour coverage, this is a decent panel. In its default mode, it covers 76% of the DCI-P3 gamut while its average Delta E was a commendable 0.7. Whites look best in the sRGB and HDR modes, both of which are selectable via the simple but easy-to-navigate OSD; AOC could learn a lesson or two from Acer here.

Perhaps surprisingly in such a stripped-back monitor, Acer finds room in the budget for speakers. These aren't going to win any awards from our sister title *What Hi-Fi?*, but they're absolutely good enough for video calls and bearable (just) if you want to listen to music at low volumes.

If your budget is $300 and only a big screen will do then this is a perfectly fine choice. However, we'd recommend the same resolution on a 27in panel such as the BenQ BL2790QT, especially as you then benefit from many more features.

The home of technology

techradar.com

HP P34hc G4 Curved Monitor

A high-quality panel, but this monitor shows its age when it comes to features – most notably no networking.

★★★☆☆

PRICE $743 from hp.com

When it was released back in 2021, this monitor ticked all the right boxes – by which we primarily mean that it supported USB-C. But here we are in 2025 and its 65W output looks weak, albeit still enough to power typical office laptops, while it loses out on increasingly common wired networking ports.

Another sign of its age is that all the ports in its USB hub are USB-A, with no USB-C option, and they're tucked awkwardly at the rear. This is where you'll also find DisplayPort 1.2 and HDMI 2.0 connectors, plus a USB-B input so that you can share peripherals (keyboards, mice, external drives for example) plugged into the USB-A ports between computers.

Compared to rivals, the P34hc's peak brightness of 262cd/m² seems a trifle dim, but it's fine for offices. And once you start using this monitor you'll simply appreciate the expanse of screen: 3,440 x 1,440 pixels across a 34in diagonal looks sharp and produces an epic amount of space on which to work. We also appreciated the high contrast ratio and 87% coverage of the DCI-P3 gamut, even if the 60Hz refresh rate won't impress after-hours gamers.

There's no sRGB mode and little control over the colour palette other than one customisable setting, but you can change the colour temperature from neutral (we measured this at 5936K) to Warm, Cool or the sepia-toned Night. There's also HP's Enhance+ mode, but this mainly controls sharpness and we quickly switched it off. Still, the OSD – based on four rear-mounted buttons – is easy to use if you want to play around. It's also worth downloading the HP Display Center app from the Microsoft Store, as this provides an easier way to control settings and provides firmware updates.

HP didn't find space in the budget to include a webcam, but we did enjoy listening to music on the speakers, which emit a smooth, almost easy listening sound. It's easy on the eye, too, with a slim bezel and minimalist stand with equally minimalist features: 130mm of height adjustment, a respectable 21° of backwards tilt but no luxuries such as swivelling.

All of this means that, HP loyalists aside, there's little reason to choose the P34hc G4. It's a solid screen with a fine pair of speakers, but the Iiyama ProLite XCB3497WQSNP offers so much more for a similar price.

ABOVE The P34hc has decent image quality but is now outdated.

MSI Modern MD342CQPW

Arguably the best-value screen on test, with a high-quality panel and all the features most people need.

★★★★★

PRICE $699 from msi.com

The MSI Modern MD342CQPW pulls off the neat trick of being one of the cheapest 34in curved monitor on test while looking like the most expensive. The next trick: to actually be a high-quality 3,440 x 1,440 panel, with an excellent set of results in our technical tests. Far more expensive panels failed to cover 87% of the DCI-P3 gamut, while its average Delta E of 0.52 puts it right up there with the best. Those who prefer to work in the sRGB gamut – where whites look a shade whiter – will also find much to love, as switching to that mode locked it to 95% of the space with a mere 1% overspill.

Only its peak measured brightness of 261cd/m² (lower than the 300cd/m² MSI claims) shoved it down the charts, but we're not concerned by this: that's fine for an office monitor. And the MD342CQPW also has plenty to offer after-hours gamers, with a 120Hz refresh rate, 4ms response times and support for AMD FreeSync Premium.

MSI makes compromises in all the right areas, too. You can't expect wired networking at this price, but the now ubiquitous USB-C port supplies a generous 98W of power to connected laptops, with one DisplayPort and two HDMI 2.0 connectors completing a fine set of inputs. Whatever you shove into the pair of USB-A ports can be shared with other computers thanks to a USB-B port, but that's your lot: no USB-C port, and note that they're all tucked away at the rear.

The OSD isn't the easiest to navigate but there's little need when it comes to the panel. MSI provides modes such as Black-White, Office, Eco and Movie, but most people will be happy with the default. It's good to see both Picture-in-Picture and Picture-by-Picture in there, though, along with a trio of eye-health checks to guard against fatigue and provide advice (albeit mis-spelt) on how to adjust the screen height for maximum comfort. While 110mm of height adjustment doesn't sound much it should be fine for most setups.

Despite the low price MSI squeezes in a pair of respectable speakers, albeit with almost non-existent bass, which makes you wonder why more expensive monitors don't do better. And that's how we generally feel about the MSI Modern MD342CQPW: that, for the price, it's simply spectacular. Sure, it could go brighter and it lacks USB-C ports and RJ45 networking, but it packs quality exactly where it counts.

apc
EDITOR'S CHOICE

ABOVE A spectacular monitor for the money.

Philips 34B2U6603CH

This Thunderbolt 4 monitor is an excellent choice for anyone on video calls all day, justifying its price.

★★★★☆

PRICE $1,199
from philips.com

PHILIPS
apc
HIGHLY RECOMMENDED

This monitor packs in pretty much every feature available. You'll enjoy 2.5GbE wired networking, a high-quality webcam, two excellent 5W speakers and, at the heart of it all, support for Thunderbolt 4. You can even daisy-chain a second monitor over USB-C, although with a 34in panel packing 3,440 x 1,440 pixels there's already plenty of space to work. Two monitors would make a killer gaming setup, though, complete with 120Hz refresh rates and adaptive sync support.

It's a solid panel that covers 82% of the DCI-P3 colour gamut, with strong colours in default mode. Philips also provides an sRGB mode that locks to 88% of that space, but with a measured colour temperature of 7556K the whites aren't as striking as we hoped. Nor is this a panel for purists, with an okay average Delta E of 1.1 and a worst result of 9.85. We also measured a significant drop-off in brightness (around 20%) on the panel's left edge.

This can be reduced using the Smart Uniformity profile in the Philips SmartImage menu, along with EasyRead (mono), Office, Photo and Game presets (and more). Those are easy to cycle through using a shortcut button, while the nippy OSD is navigable using four buttons on the bottom right edge of the bezel. This is where you can activate yet more features, such as sensors for people and ambient light.

The left bezel edge houses three more buttons. One activates a busy light on top of the pop-up webcam unit, with a bright red LED strip to tell people not to interrupt you (this can sync with Teams, too). There's also a handy button to mute the mic, at which point a subtle white LED light then appears. But the biggest factor in Philips' favour is the webcam's quality: we would be more than happy to take calls on this all day.

There's auto framing if you want it, along with a tiltable webcam unit. Combined with an extremely flexible stand, with up to 180mm of height adjustment, you should find it easy to find the perfect position on your desk. The screen also tilts all the way back 30° and, incredibly for such a large unit, it swivels 360°.

If the Philips could have matched the ViewSonic for image quality and whites then it would be walking away with five stars, but all of its other strengths lift it above rivals for a well-deserved Recommended award.

ABOVE You'll not be left wanting for features if you plump for this Philips display.

ViewSonic VG3457CV

If you're stuck on video calls all day then consider this high-quality monitor, but it has its frustrations.

★★★★☆

PRICE $1,227
from viewsonic.com

ViewSonic
34"
1500R
DOCKING
USB-C
apc
HIGHLY RECOMMENDED

The 34in curved ViewSonic VG3457CV is designed to be a one-stop, do-it-all docking monitor. Along with the usual physical network port and USB hub, it provides a Zoom-certified 5MP webcam complete with microphone and fill-in LEDs – not needed in good lighting, where this webcam excels, but they provided a helpful lift in darker situations.

You can tune the fill-in lighting with settings for brightness and warmth, and unlike the Iiyama ProLite XCB3497WQSNPH the camera has a limited amount of tilt. It's a pop-up webcam so hides away for privacy, but it's nice to see support for Windows Hello. However, it feels plasticky, and on the first sample ViewSonic sent us the camera didn't work – this makes us worry about durability, although the excellent five-year warranty covers the webcam as well.

ViewSonic has thought about the problems faced by regular video callers, with a shortcut on the bezel to mute the microphone complete with a red LED indicator. The four other shortcuts allow you to switch between screen settings based on scenarios (such as office use and gaming), mute the speakers, take control of the fill-in lighting and access the full OSD. Sadly, more work needs to be done by ViewSonic's UX team, as the OSD isn't as easy to use as rival offerings.

Another irritation is that it's difficult to push the panel beyond medium brightness, so keen is ViewSonic to keep it in Eco mode: the secret is to move out of the default View mode and into, say, Mac mode, at which point our measured peak leapt from 252cd/m^2 to 378cd/m^2. However, power consumption also jumped from around 30W to 42W.

The 3,440 x 1,440 panel itself is top quality. It looks sharp and is tuned to the DCI-P3 space, covering a punchy 87% for vivid colours, with excellent accuracy. What's more, its whites are excellent. With a 100Hz refresh rate and measured contrast ratio of 2,213:1, it's a solid choice for gaming too, while its speakers go loud and produce decent results. Not hi-fi good, but enough for background music during a working day.

Sat next to the Iiyama ProLite XCB3497WQSNPH, the ViewSonic looks expensive, while it lacks the advanced features of the Philips 34B2U6603CH. But make no mistake: the VG3457CV is a high-quality panel that is a great choice for Zoom fans in particular, only missing out on award due to the strength of the competition.

ABOVE Ideal for video calls, and with superb image quality.

Iiyama ProLite XCB3497WQSNP

Plots the sensible middle ground to produce a value monitor that includes what most people need.

★★★★★

PRICE $634
from iiyama.com

iiyama
apc
EDITOR'S CHOICE

ABOVE A curved 34in panel provides plenty of space for multiple windows.

The Iiyama ProLite XCB3497WQSNP is one of five monitors in this Labs to be based around a 34in curved panel with a 3,440 x 1,440 resolution, and we can understand why it's so popular. It's almost equivalent to having two monitors on your desk, with an extravagant 21:9 aspect ratio that provides room for four, even five, windows side by side.

The ProLite is our pick of them all for the simple reason that Iiyama covers all the most important bases at a more competitive price than the feature-laden Philips 34B2U6603CH. So you don't get Thunderbolt 4 or daisy chaining, but the USB-C connector can output up to 95W of power, and if you want to connect other computers you have two HDMI ports and one DisplayPort connector to choose from.

LEFT The flexible stand offers plenty of tilt and swivel options.

Unlike HP, Iiyama includes a physical network port, with a USB hub comprising two USB-A ports and a single USB-C port. A USB-B port is also present if you want to share connected peripherals with the other system, although you will need to head into the OSD to dictate which video input this relates to (others use a smart KVM that does this job for you).

You'll also need to activate the camera via the OSD, which might be considered a sensible security precaution were it not for the very obvious privacy shutter. Video quality is the worst of the four webcams built into monitors this month, as is the microphone, but it will get you through a call in an emergency. Likewise, we wouldn't recommend throwing away your current speakers to make way for the 5W duo that sit here, but they're just about good enough – at a push – for listening to music.

The webcam's final downside compared to the Philips is that it's fixed, so the only way to adjust the angle is to move the panel, but the good news here is that the ProLite XCB3497WQSNP includes a flexible stand: there's 150mm of height adjustment, a respectable 23° of backwards tilt and a surprisingly generous 45° of swivel in either direction. And while this isn't the most stylish of stands, the whole assembly feels well built.

Iiyama plots a sensible middle course when it comes to quality, aiming for the mainstream worker rather than the creative professional. The panel covers 85% of the DCI-P3 gamut, which means impactful if not eye-gouging colours, and it does so with solid accuracy: we measured an average Delta E of 0.83 and a maximum of 3.22, and while that won't wow any print designers it means you can trust the displayed colours.

BELOW Iiyama includes a physical network port, as well as USB-A, B and C.

It's fortunate that this default profile is so pleasant on the eye – including respectable whites that benefit from pumping up the brightness to around 250cd/m^2, with a peak of 371cd/m^2 on offer – as Iiyama doesn't offer, say, an sRGB profile. You can adjust the hue and saturation, and play around with the i-Style presets that let you switch between Text, Cinema, Scenery and Game, but to limited effect. The latter, for instance, boosts the brightness and contrast while activating the overdrive to give you 5ms response times, but most casual gamers (avid gamers should buy a specialist screen) will be happy with the default performance in Standard mode thanks to the 120Hz refresh rates.

All these settings are only accessible via the OSD, with no fancy software on offer, and in truth it's clunky. Everything relies on the joystick that sits beneath the Iiyama logo at the bottom of the screen, which you use to navigate a selection of icons – press up when you find the one you want. You're then taken to the relevant part of the full OSD, after which you need to work out whether to press left, right, up or down to activate the option. It's confusing at first, but there is logic at play once you understand its quirks, and unlike some rival OSDs it is at least nippy.

Is this an exciting monitor that will set your pulse racing each time you gaze at it? Absolutely not. But it's well built, the image quality is great and best of all it provides a wide expanse of space on which to work and play.

How we test

Details of the exhaustive procedures we put each screen through.

As with all our testing, where possible we use a mix of real-world and technical tests to determine the quality of the products. Here, that means using each monitor as our daily work screen to see not just how enjoyable it is to look at but its usability: how intuitive is the on-screen display, how well engineered is the stand, how convenient are the ports?

We also explore the OSD in depth to see what options it provides users. In particular, we will praise screens that allow people to switch between colour profiles – say from sRGB to DCI-P3. But only if that switch is effective, which is where our technical tests come in.

These use an X-Rite i1 Display Pro HL colorimeter in tandem with the display calibration and profiling software, DisplayCal. We measure each display's maximum brightness in cd/m² (equivalent to lumens), its contrast ratio and colour temperature. We also measure each panel's colour gamut as a percentage of the sRGB, DCI-P3 and Adobe RGB gamuts. We take these measurements in the default setting (as supplied), and those colour profiles if available.

We then test the evenness of the LED backlighting by measuring brightness and contrast across 25 points on the screen. In addition, we test each monitor's colour accuracy (using the sRGB profile if available) from a central point on the screen. This process measures how close the display colours are to their intended shade. The difference is measured in the unit of colour difference, Delta E: the higher the figure, the poorer the match.

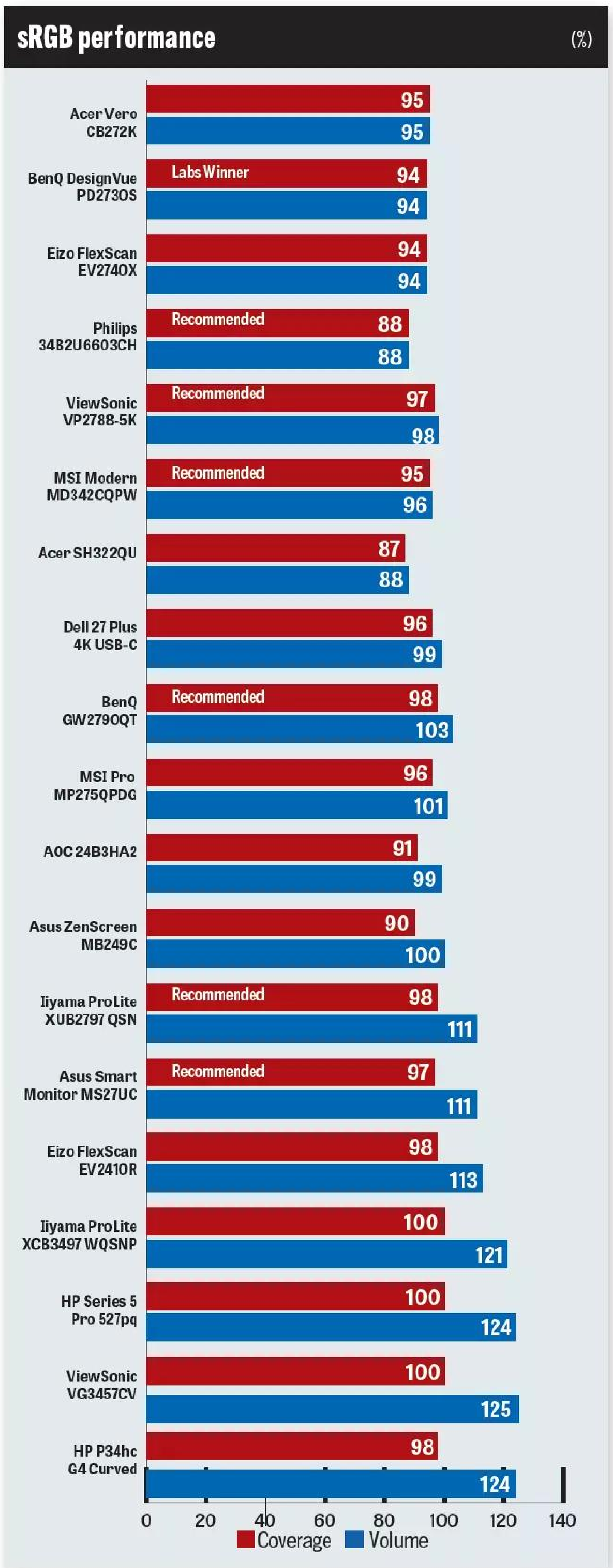
Finally, we check how much power each monitor consumes at 200cd/m² and at its peak brightness.

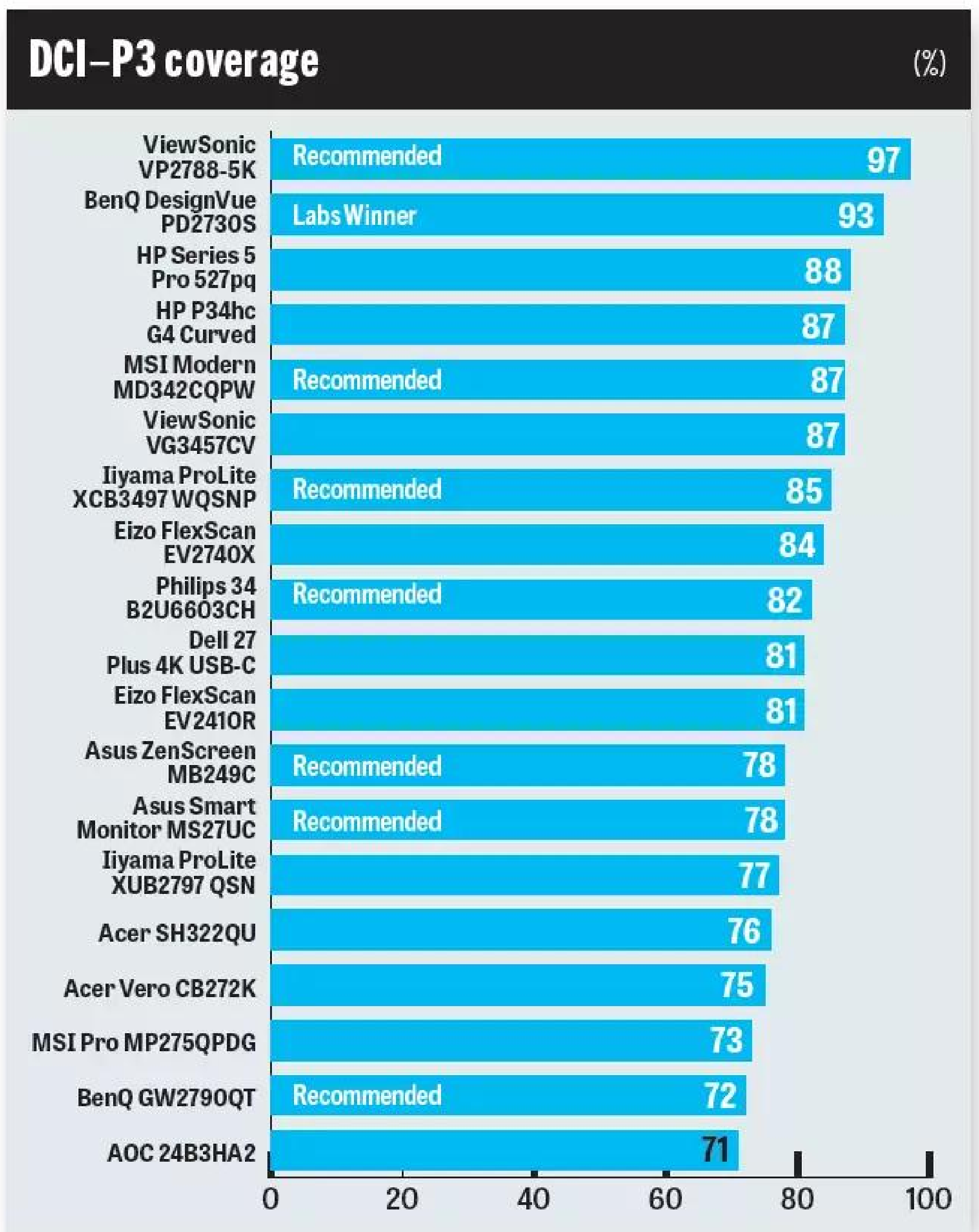
calibrite
DISPLAY PRO

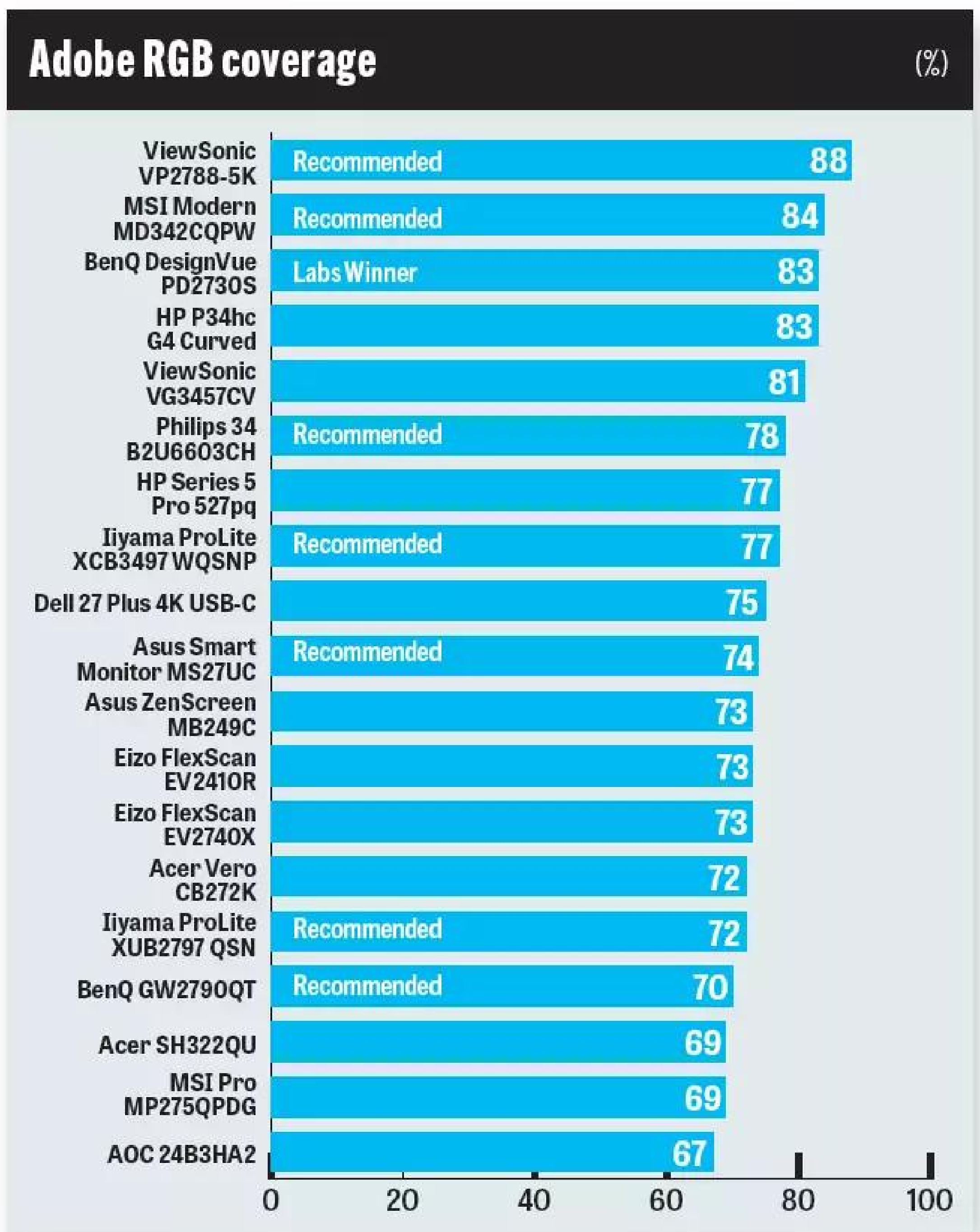
LEFT An X-Rite i1 Display Pro HL colorimeter helps us determine a display's image quality.

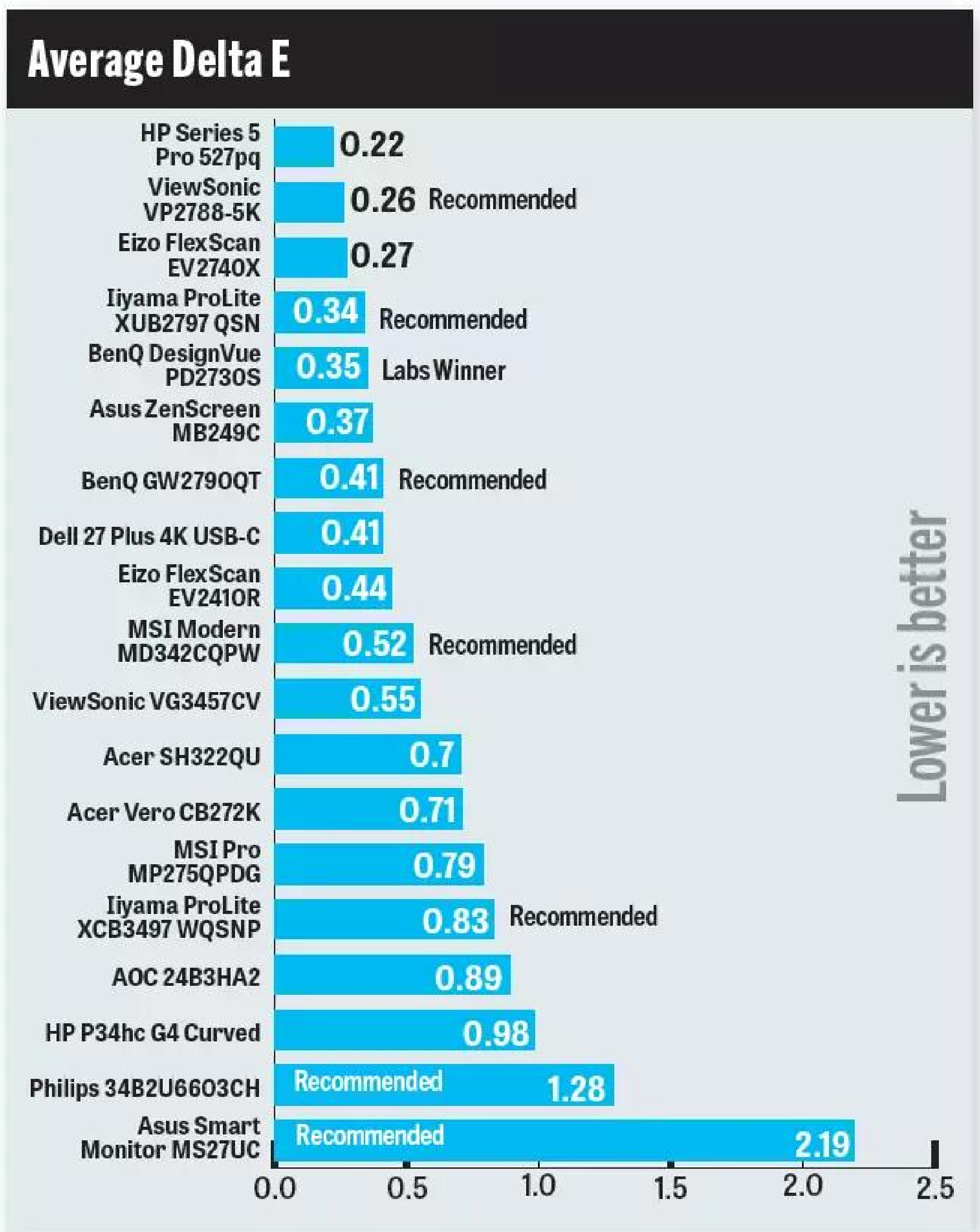
Quality test results

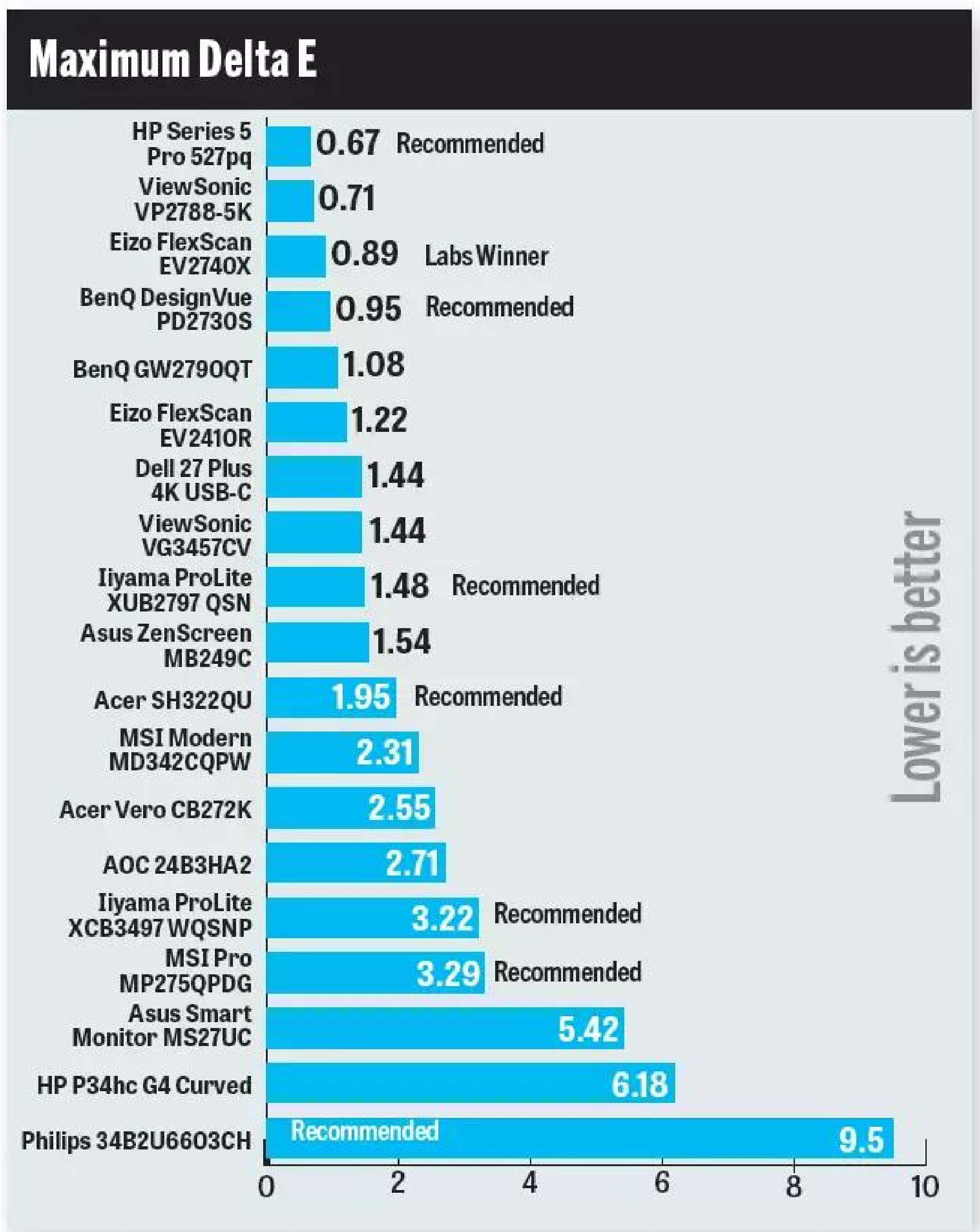
COLOUR TESTING Note that colour space testing was performed in the monitor's relevant mode (such as sRGB or DCI-P3) if available. If not, we used a 6500K colour temperature. If that wasn't available, we used the default mode. The ideal is for a monitor to achieve 100% sRGB coverage and 100% volume; a big difference between the two values shows the panel isn't tuned to that colour space.

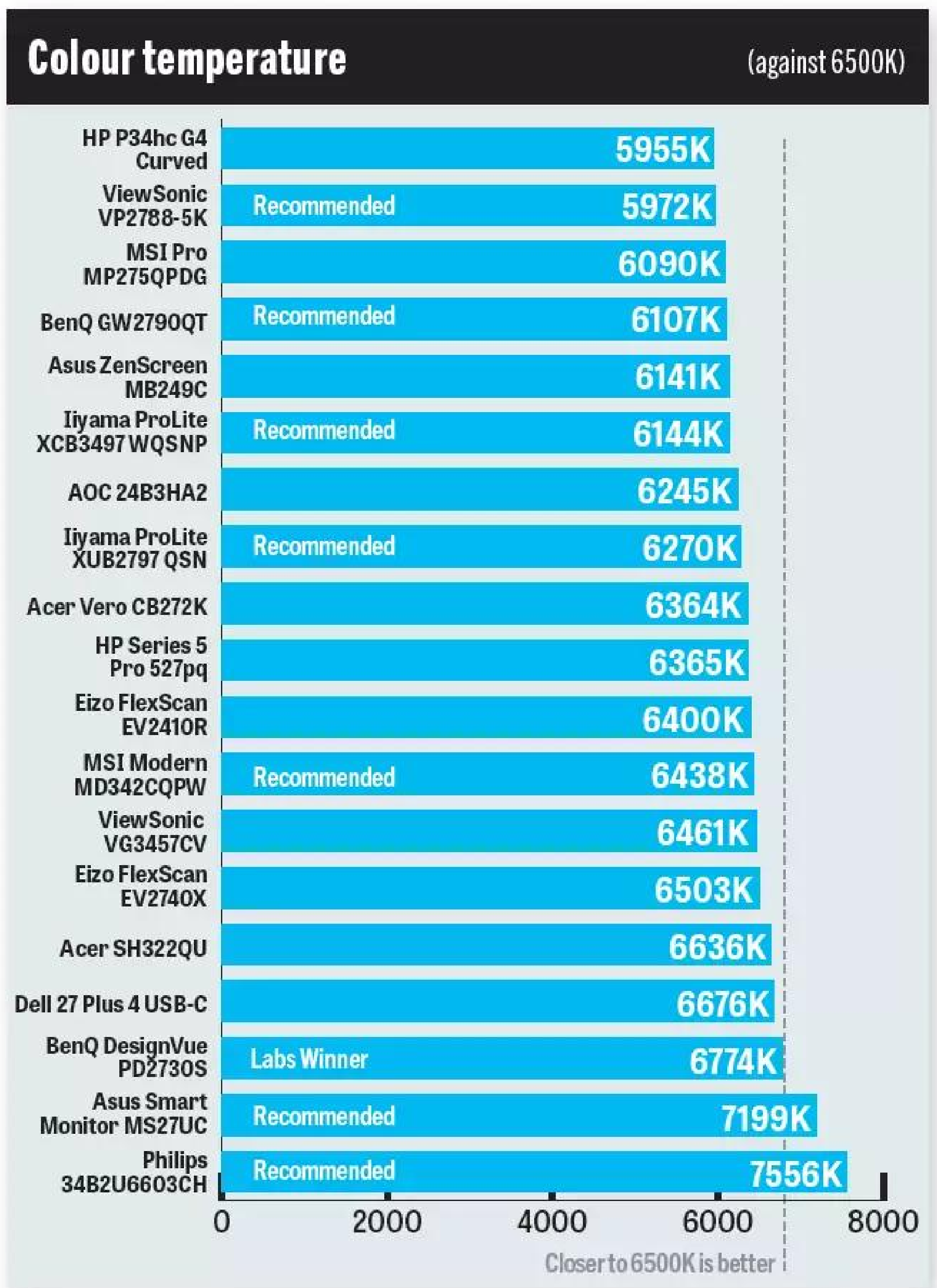


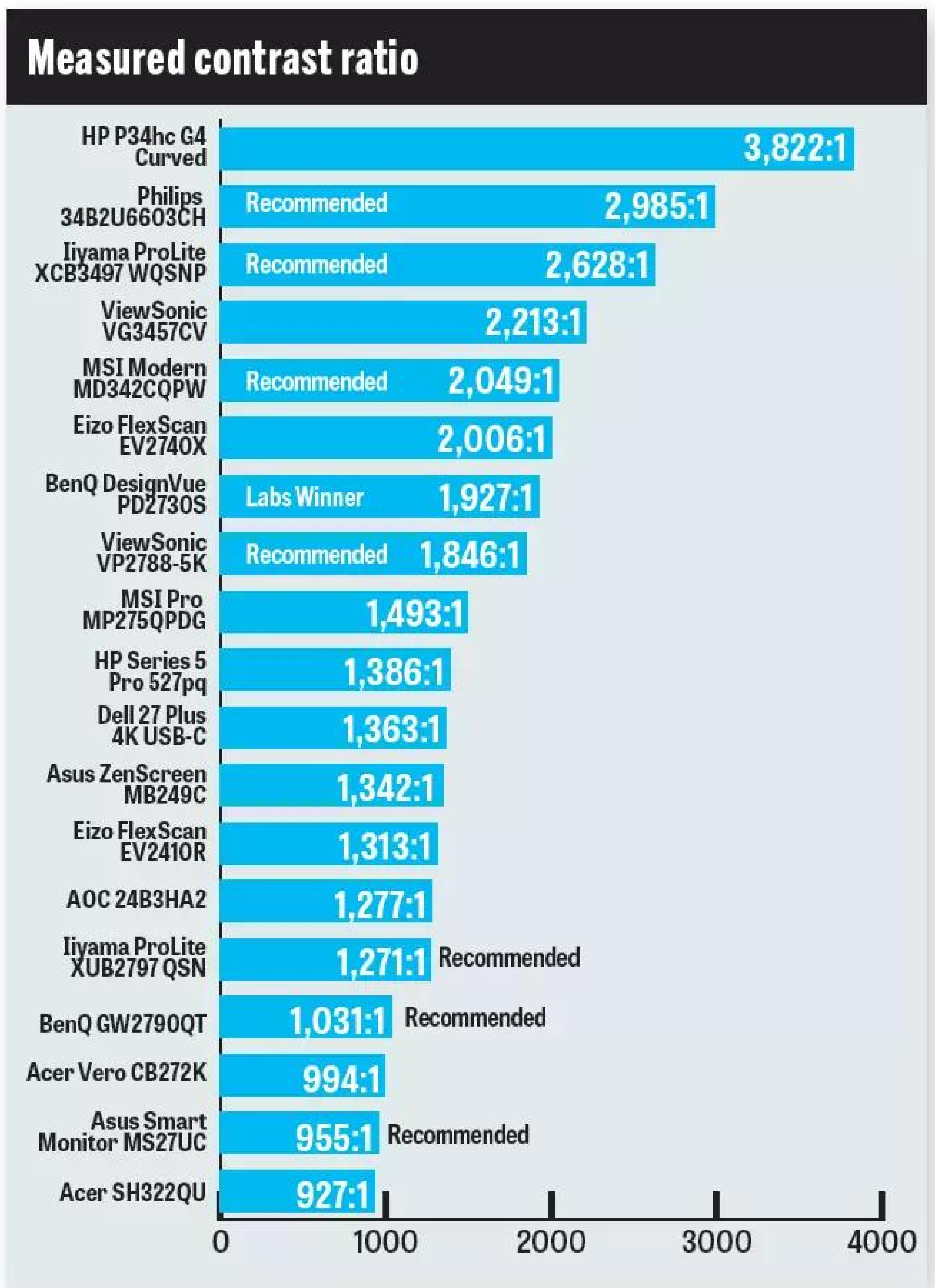


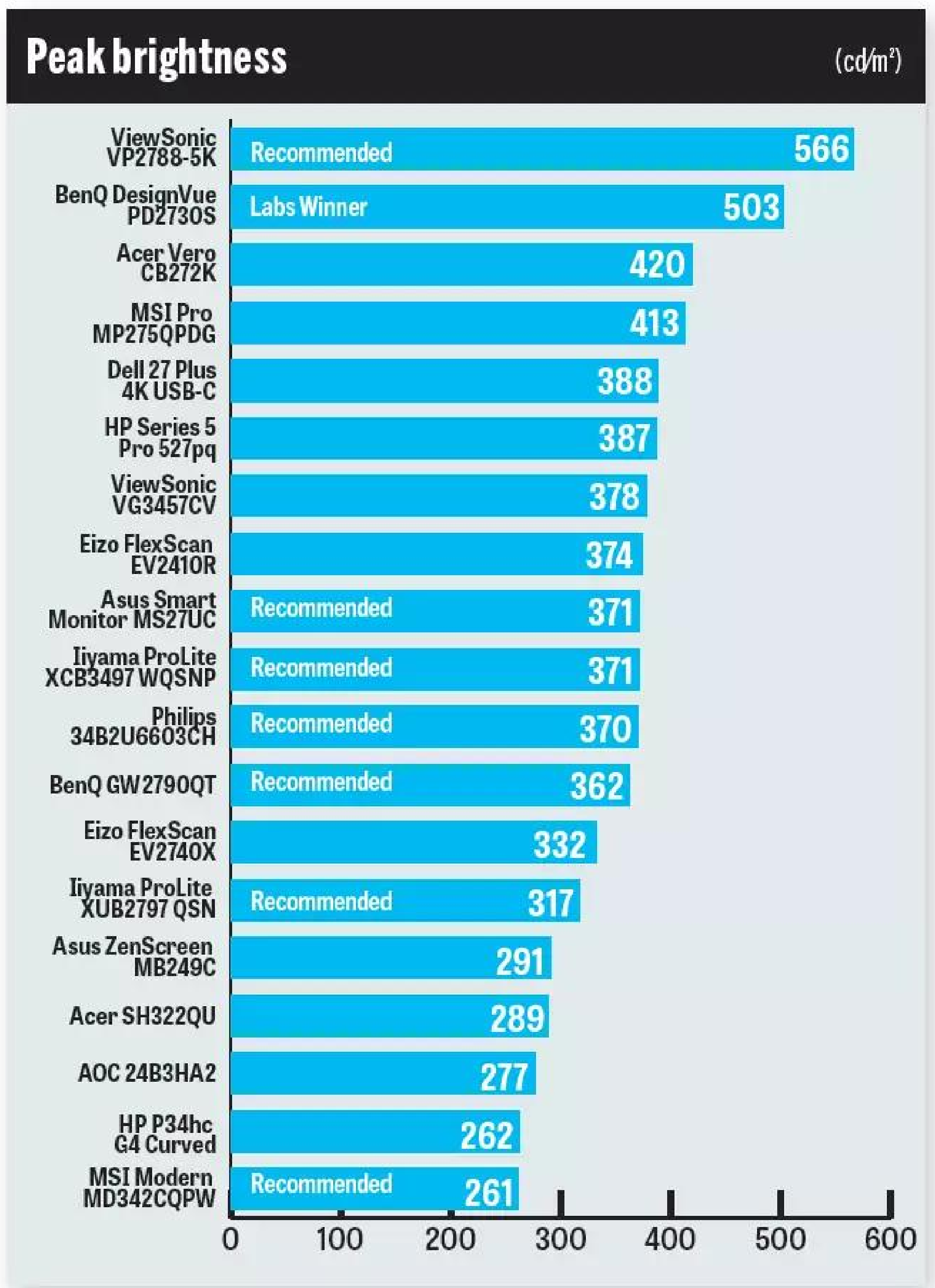


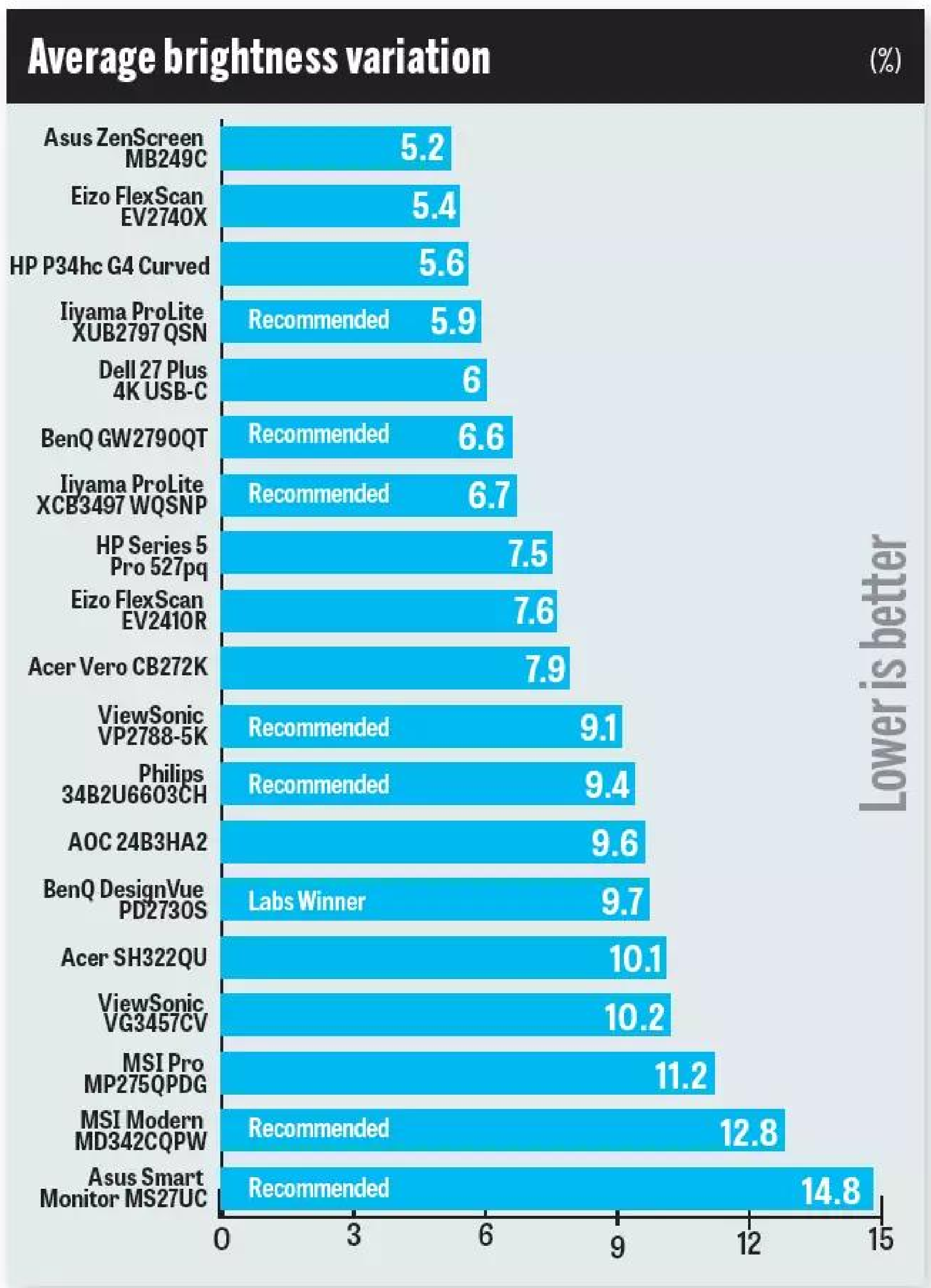


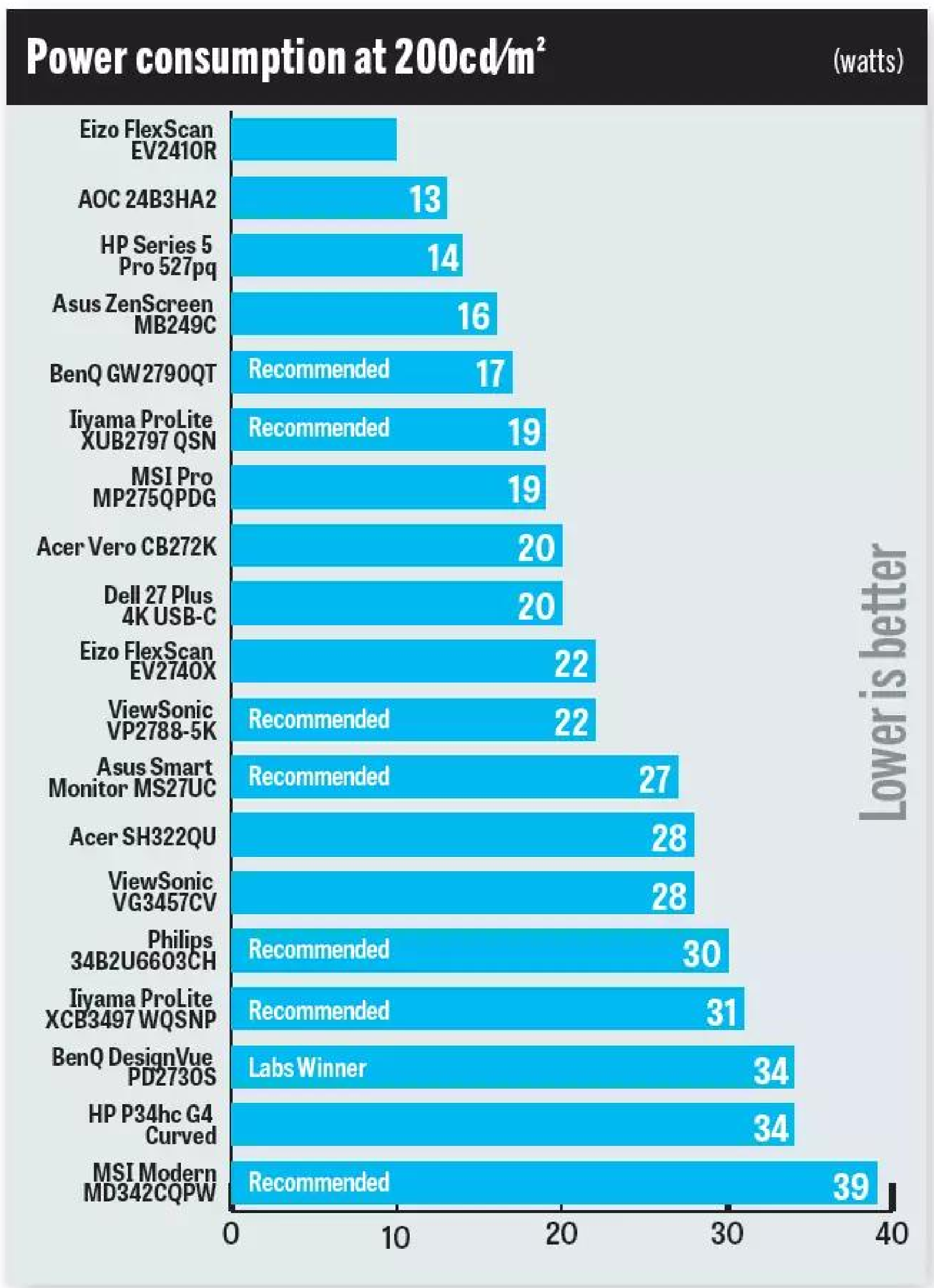


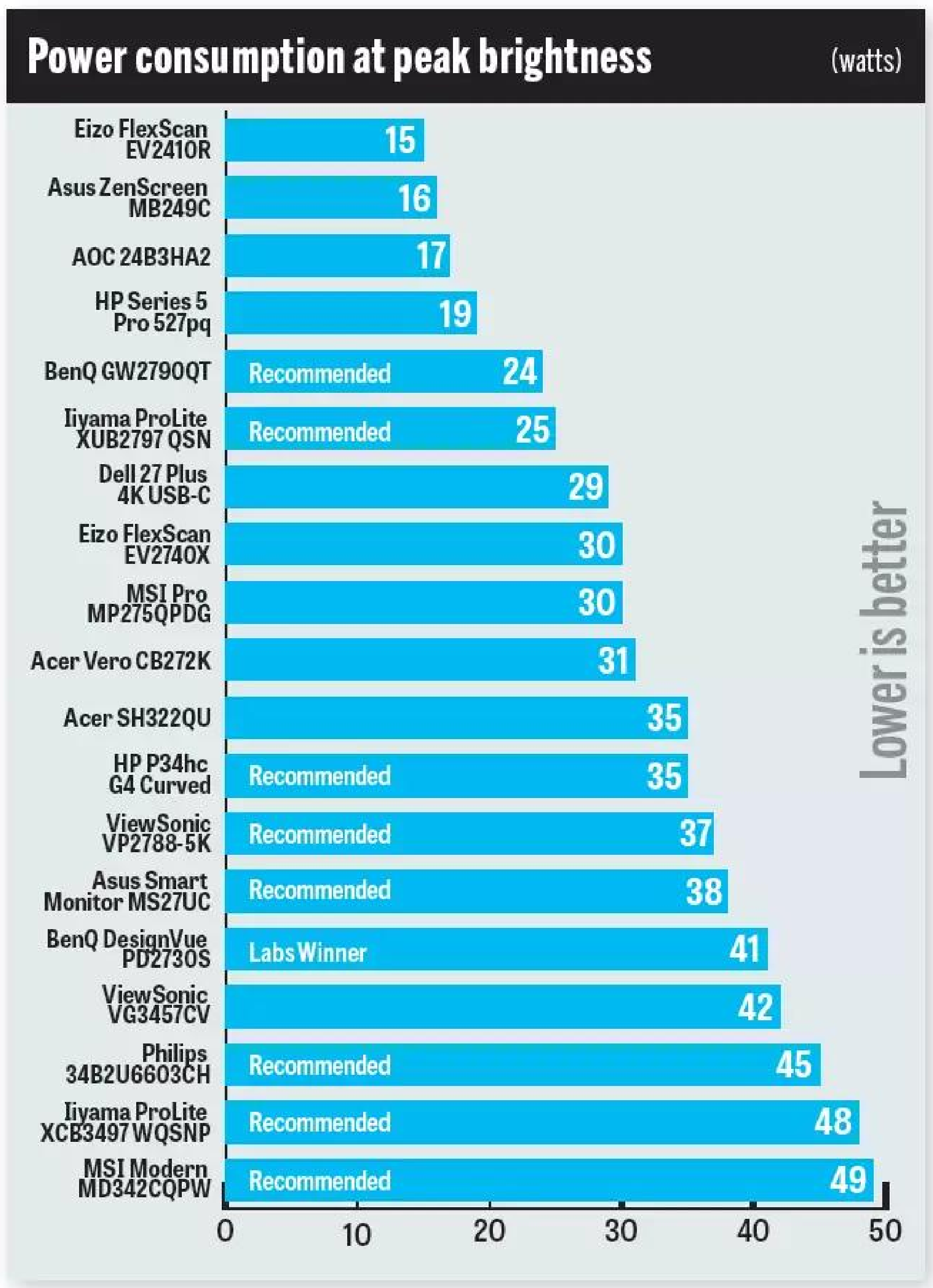












View from the Labs

We live in a golden era of choice, but still take time to choose wisely.

If you know me well then you will have heard me wax lyrical about the comedy writer John Finnemore, perhaps most famous for the excellent radio show Cabin Pressure (starring Benedict Cumberbatch, Roger Allam and the brilliant Stephanie Cole) and his contribution to the Paddington films. But he also wrote a sketch about choice.

"First," the narrator intones, "there was no choice." "This is it," says a car salesman. "It's big, it's grey and it sometimes catches fire." The next step: not enough choice. "All right, there are two kinds," explains the salesman. "There are the big grey ones that sometimes catch fire, or these small brown ones that don't work."

"Then, for about five minutes, there was just enough choice," says the narrator. Cue the salesman. "All right, you can have a big one or a small one, and you can have it in red, blue or green. The red ones sometimes catch fire, the small ones don't work, and the big green one only works in Russian. And the small red one comes with a cup holder."

Naturally, the customer chooses the big blue one that works and doesn't catch fire. And then comes the phase facing us all: too much choice. This time, the salesman explains, "you can have a red one, a blue one, a purple one, an ochre one or an invisible one. They come in big, small, medium, extra medium, micro, giga and vast." I won't quote the rest of the sketch for fear of Mr Finnemore's copyright lawyers, but you get the gist – and can listen to the full sketch by loading up Series 3, Episode 2, of John Finnemore's Souvenir Programme.

Parallels with monitors, which do indeed come in sizes ranging from small to giga, should be obvious from this Labs, and one has a holder – for headphones. But weirdly, I think we now have just the right amount of choice. You can buy smart monitors, cheap and cheerful monitors, high-end professional monitors – and none of them will catch fire.

My only word of caution is to choose carefully. You will likely be staring at your choice of monitor for years to come, so it pays to put the time in before you make your choice. ■

Tim Danton fell secretly in love with at least four of these monitors.

Find the best deals
on new gear at
getprice.com/au

The A-List

The best products on the market, as picked by our editors.

Premium laptops

Apple MacBook Pro M4

ONE OF THE BEST LAPTOPS THAT'S EVER BEEN MADE.

This M4 update to the already brilliant MacBook Pro line is an easy recommendation, so the big question becomes do you choose the 14in version or 16in. But whatever you choose should last for years, and look great while it's doing it.

From $2,499, apple.com/au

THE ALTERNATIVES

ASUS ZENBOOK A14
This affordable and super-slim laptop with a 14in OLED panel has all the performance most people need at a very competitive price, and it boasts fantastic build quality.
$1,999, asus.com

APPLE MACBOOK AIR M4
If you don't need the all-out power of the Pro, this is a brilliant, cheaper alternative despite the unchanged chassis and screen.
From $1,699
apple.com/au

MICROSOFT SURFACE LAPTOP 7
A shining example of just how good a Windows laptop can be. Despite a few minor drawbacks, the Surface Laptop is a fantastic package that offers performance and battery life.
$1,899, microsoft.com

Business laptops

HP OmniBook X

THE QUALCOMM CPU REALLY DELIVERS.

The latest Qualcomm CPU helps create a standout laptop that will impress compared to Intel powered alternatives. The OmniBook X has been on sale across all major retailers for $2,079. At this sort of price the X is the cheapest Snapdragon X Elite laptop going, and a compelling buy.

From $2,079, hp.com

THE ALTERNATIVES

DELL PRO 13 PREMIUM
Dell's business laptop series has a new name, but its commitment to build quality and astonishing levels of configuration remain the same.
From $2,536
dell.com/en-au

ASUS ZENBOOK S 16
The Asus Zenbook S 16 offers premium performance in the ultraportable category and competes well with alternatives such as the Surface Laptop 7 or Macbook Pro.
$3,499, asus.com.au

LENOVO THINKPAD X1 CARBON GEN 13
The best executive laptop out there, with true all-day battery life. At 1kg and with the latest components, it's worth the price.
From $3,300, lenovo.com/au

Gaming laptops

Alienware m16 R2

A PREMIUM AND AFFORDABLE GAMING & WORK MACHINE.

There are cheaper gaming laptops, and faster ones too, but we love the balance offered by the m16 R2. Who doesn't want a big 16in gaming laptop, featuring a Ultra 9 CPU, a RTX 4070 GPU and 32GB of RAM? And for a decent price, considering it's from Alienware.

$3,300, dell.com

THE ALTERNATIVES

LENOVO LEGION PRO 7I GEN 10
A surprisingly elegant chassis considering the power within. Lenovo doesn't put a foot wrong with this.
From $3,749
lenovo.com/au

ACER NITRO V 16
It's a cheap and cheerful gaming laptop, but that's exactly what the Nitro V series does best, and overall this new 16in model offers great bang for buck.
$1,500, store.acer.com

ASUS ROG ZEPHYRUS G14 (2025)
AMD's Ryzen AI 9 HX 370 CPU combined with the RTX 5080 GPU in this slimline chassis complete with 14in OLED panel.
$6,999, asus.com

Everyday laptops

Lenovo Yoga Slim 7x

A BEAUTIFUL MACHINE THAT COMBINES STYLE, GREAT TECH AND STRONG VALUE.

Lenovo fought off all-comers in our most recent group test due to its all-round quality – we love the slimline, blue, all-metal design and 14.5in OLED panel – and the fact that its battery keeps this 1.3kg laptop going for over 20 hours. It's a great advert for Qualcomm's Snapdragon X Elite chips.

From $1,949, lenovo.com/au

THE ALTERNATIVES

ASUS VIVOBOOK S15
This affordable laptop still includes an all-metal shell and 15.6in OLED panel, saving money by using a solid 8-core Snapdragon X Plus chip.
$1,999, asus.com

NEW **MICROSOFT SURFACE PRO (X ELITE)**
The versatile top of the line Surface Pro 2-in-1 sports the 12 core Snapdragon X Elite. Its OLED screen is stunning.
From $2,699, microsoft.com

MICROSOFT SURFACE LAPTOP 13-INCH
Another Microsoft laptop powered by a Snapdragon chip, but it's low power so this stylish laptop is best for less demanding tasks. **From $1,358, microsoft.com**

Chromebooks

Asus Chromebook Plus CX34

A sleek and relatively affordable ChromeOS workhorse, the Asus Chromebook Plus CX34 delivers strong performance and features at a competitive price when on sale, and is ideal for budget-conscious users.
$699, asus.com

Lenovo Flex 3i Chromebook

This isn't the most powerful Chromebook, but students need reliability more than power – especially if they're only really using it for homework, note-taking, and perhaps the occasional bit of Netflix.
$367, lenovo.com/au

Lenovo IdeaPad Duet

The Chromebook answer to Microsoft's Surface tablets, this is a seriously versatile device – albeit not the speediest (although we never found it to be painfully slow while carrying out everyday tasks). For this price, and with a 16hrs 14mins battery life, the Duet is a great choice.
$297, lenovo.com/au

Tablets

Apple iPad Air (M3)

It's hard to be too excited by this update as it's exactly the same design but with an M3 chip inside. But when the original was so damn good, whether in 11in or 13in variants, and Apple Intelligence is thrown in, it remains the best choice for the vast majority of tablet buyers.
From $999, apple.com/au

Apple iPad Pro (M4)

The best tablet in the world becomes even better thanks to Apple's stunning M4 chip, a gorgeous OLED screen and the must-have accessory: the all-new Pencil Pro. But it comes with an obvious downside of cost, with the cheapest 13in incarnation costing $2,199.
From $2,199, apple.com.au

Samsung Galaxy Tab S9 Ultra

This 14.5in tablet offers a size and versatility that even the iPad Pro can't match, with its high price more than justified by the quality of Samsung's AMOLED panel, speakers and productivity software.
$1,999, samsung.com

Everyday monitors

Asus ROG Swift OLED PG32UCDP

We've seen several ultimate gaming monitors in recent months but, from the specs alone, Asus might just have made the most *ultimatest*: 480Hz refresh rate, matte-screen HDR OLED, 32-inch 4K.
$2,399, asus.com.au

NEW

BenQ GW2790QT

Targeted at office users, this 27in, 1440p monitor is packed with quality, from its brilliant OSD to several clever features designed to fight eye fatigue. Text and images look sharp and punchy, its USB-C docking capability is always welcome.
$459, benq.com

NEW

LG UltraGear 45GX950A

This doesn't settle for anything less than being the best. Operating an enormous 5K/2K resolution with a 165Hz/330Hz refresh rate, the UltraGear satisfies the needs of competitive and cinematic gamers alike – at a fairly high cost.
$3,499, lg.com

Professional monitors

Asus ProArt Display OLED PA32UCDMX

A brilliant, does-it-all monitor for professionals who won't wince at the price. Its price tag makes it an expensive option for demanding consumers, but we expect professional studios to buy crates of them.
$2,799, asus.com

ASUS ProArt

NEW

BenQ DesignVue GW2730S

A great choice for creative professionals and demanding users alike, and if your budget can take it why not daisy-chain two together over Thunderbolt? You'll love the image quality and 5K resolution.
$459, eizoglobal.com

NEW

MSI Modern MD342CQPW

A high-quality panel that includes all the features most people need. Sure, it could go brighter and it lacks USB-C ports and RJ45 networking, but it packs quality exactly where it counts.
$699, msi.com

Home office printers

HP OfficeJet Pro 9130e

This versatile inkjet all-in-one – which includes a 35-page ADF – pumps out high-quality prints at laser-rivalling speeds. Likewise scans and copies. Print costs are reasonable, too.
$248, hp.com

Canon i-Sensys LBP243dw

Everything you could want from a mono laser printer – it doesn't come with a scanner – the LBP243dw produces excellent results at speed. You also get Wi-Fi and wired networking.
$479, canon.com

Brother MFC-J4540DW

Home workers will love this inkjet all-in-one. It combines an incredible range of features with all the connectivity you need and extreme ease of use. Output quality is fine, it offers the best cloud support around and the high-capacity ink pack could keep you going for years.
$329, brother.com

Find the best deals
on new gear at
getprice.com/au

Wireless routers

Asus RT-BE92U

A premium, consumer-grade Wi-Fi 7 that doesn't cost the Earth. The Asus RT-BE92U doesn't put a foot wrong. It's fast, feature-packed and it even looks good too. At $424 it's also excellent value and is our new Editor's Choice.
$424, rog.asus.com/au

Netgear Nighthawk RS100

Don't be put off by the low price – the RS100 gives you a very viable Wi-Fi 7 service, without making you pay for high-end features and performance you don't really need.
$199, netgear.com/au

TP-Link Archer BE550

This is a brilliant mid-range choice thanks to a 6GHz radio and five 2.5GbE ports – you'll enjoy superb wired and wireless performance, and it even comes with a wide set of features. It's priced well and looks fabulous
$398, tp-link.com

Mesh Wi-fi

TP-Link Deco XE200

There are cheaper Wi-Fi 6E meshes, but the XE200 wins for its superb download speeds, excellent coverage and the fact that older clients reap benefits of 6E, not just new ones. And a two-pack should be enough for most premises.
$1,299 (2-pack), tp-ink.com

TP-Link Deco X20

The Deco X20 makes it possible to upgrade your home network to Wi-Fi 6 for the price of some standalone routers. The HomeCare functions are also a great bonus for households where lots of devices are fighting over the bandwidth. **$227 (2-pack), tp-link.com**

Asus ZenWiFi AX

The interface and design certainly aren't the prettiest (the charcoal version is straight out of the 1980s), but if you're after strong performance, great features and plenty of expansion potential, the ZenWiFi AX is a compelling prospect.
$939 (2-pack), asus.com/au

NAS servers

Asustor Nimbustor 4 Gen2 AS5404T

A particularly strong choice as a media server, the updated Nimbustor 4 is both flexible and quick. Asustor's Nimbustor 4 AS5404T is a four-drive NAS enclosure aimed at demanding home users or small offices.
$879, asustor.com

Synology DiskStation DS925+

Casual NAS users will find better value elsewhere. However, access to the vast, polished and professional Synology ecosystem will more-than justify the high price to buyers who make use of it.
$1,099, synology.com

Qnap TS-264

The Qnap TS-264 is aimed at those who want a bit more from a traditional two-bay NAS. It's effectively the two-bay version of the excellent four-bay TS-464, and provides strong speeds over its pair of 2.5GbE ports – and includes two M.2 NVMe slots.
$729, qnap.com

Security software

Avast Ultimate

Buy from retail and this is a bargain, with a solid VPN, anti-tracking software and handy detection fees on top of excellent protection.
~$65, 1 device, avast.com/en-au

THE ALTERNATIVES

G DATA TOTAL PROTECTION
Despite its quirks, G Data provides straightforward, effective and inexpensive protection against malware and other threats to your system. **1 device, US$50, avast.com**

AVAST ONE ESSENTIAL
Essential has the same malware-detection engine as our top choice, but for free. It even includes 5GB of VPN services per month and a few system optimisation tools.
Free, avast.com

NordVPN

NordVPN provides consistent and fast speeds, serious security, great support for video-streaming services and some cost-effective subscription rates.
$59 per year, nordvpn.com

THE ALTERNATIVES

PROTONVPN
ProtonVPN provided one of the best free offerings of all the VPNs in our group test, including unlimited data, but upgrade to benefit from even faster speeds and many more options.
Free, protonvpn.com

SURFSHARK
A strong rival to NordVPN, especially if you're willing to commit to its two-year contract. It's fast, cheap and a fine choice for people who like to switch to US streaming services.
$79.61 for one year, surfshark.com

Bitwarden

Bitwarden has a huge advantage: it's free. It isn't as slick as some paid-for rivals, but it can sync passwords across all devices for no extra charge. **Free, bitwarden.com**

THE ALTERNATIVES

DASHLANE
A manager that's ideal for beginners, and it even builds in an unlimited (if basic) VPN service. Note you may prefer to buy the Family plan ($60 per year) as this extends the service to six people.
$55.99 per year (Premium), dashlane.com

1PASSWORD
1Password is targeted at users who are looking for the last word in security. It even offers a Travel Mode that may ease your mind if surrendering your phone to customs officials. **$54.99 per year (individual), 1password.com**

Market Watch

Mark Williams spotlights representative PCs in the market today.

UMART G5 58938

$1,799

tinyurl.com/APC550umart

Hitting all the notes of an entry level gaming PC, this gets all the basics right. The CPU sits nicely in the best-bang-for-your-buck zone, and with 16 threads on offer has a reasonable amount of multithreaded performance for productivity.

The 32GB of RAM could've easily been 16GB to save some money (or help profit margins) but with 32GB quickly becoming the standard these days it leaves this system in good stead. 1TB of storage is to be expected, as is the PSU, thanks to the not so demanding GPU. The 8GB of VRAM will pinch you as time goes on, but to get your started, it's great for anyone with eSports like aspirations or simply light gaming.

CPU Intel Core i5-14400F; **COOLER** Thermaltake HSF; **MOTHERBOARD** B760M-A WiFi; **GRAPHICS** GeForce RTX 5060 8GB; **MEMORY** 32GB DDR5; **STORAGE** 1TB NVME SSD; **POWER SUPPLY** 650W; **CASE** Cooler Master Elite 302.

PLE COMPUTERS LUNAR RTX 5060

$1,899

tinyurl.com/APC550ple

Coming in $100 dearer than the Umart system, this system's big draw card is a latest generation Intel CPU. Despite having 6-threads fewer to work with, the faster Arrow Lake cores let it outpace the older part comfortably in both gaming and productivity. The motherboard also offers faster connectivity options here too.

Aside from that, the rest for the system is remarkably the similar though does have a slightly lower PSU rating at 600W.

If you have the money to spare, this might be the better option of the two if you plan to do some system mid-life upgrades later.

CPU Intel Core Ultra 5 225F; **COOLER** Jonsbo CR-1000 Evo; **MOTHERBOARD** Asus Prime H810M-A WiFi-CSM; **GRAPHICS** Asus GeForce RTX 5060 Dual OC 8GB; **MEMORY** 32GB GeIL Orion V RGB DDR5-6000 C38; **STORAGE** 1TB Team T-Force G50 PCIe Gen4 NVMe M.2 SSD; **POWER SUPPLY** FSP Hydro K PRO 600W; **CASE** DeepCool CH370.

MWAVE RESPAWN NINJA KATANA GT-W

$3,699

tinyurl.com/APC550mwave

This rig knows its target market and goes for the win. The CPU, despite being from the previous generation, is still the second fastest gaming CPU available, saving you a few dollars to get near top end performance is always a nice choice. Same goes with the GPU. Trading blows with the RTX 5070 Ti, the 9070 XT is about as high up the stack as you'd want to go before budgets start to balloon. Both silicon choices keep your wallet from melting while giving you retina searing levels of pixel fill rates.

RAM, SSD and PSU choices here are all solid and as expected for this price bracket. The fish tank style case is just icing on the cake to show off what is a grand gaming rig for the price.

CPU AMD Ryzen 7 7800X3D; **COOLER** Deepcool LE360 V2 360mm AIO; **MOTHERBOARD** MSI B650 Gaming Plus WIFI; **GRAPHICS** Gigabyte Radeon RX 9070 XT Gaming OC 16GB; **MEMORY** 32GB Team T-Force Delta RGB DDR5 6000MHz CL38; **STORAGE** 2TB Crucial P310 PCIe 4.0 NVMe M.2 SSD; **POWER SUPPLY** Cooler Master GX II 850W; **CASE** Antec C7.

AFTERSHOCK PC FLOW ICE LVL 8 PRO

$3,800

tinyurl.com/APC550shock

Taking the fight to the Mwave system, this rocks similar RAM, SSD, cooler and PSU specs. At $100 more, however, this system begins to struggle a little on the value front. With the non-X3D Ryzen 7 7700, in gaming at least, this system will struggle a bit more in CPU bottlenecked scenarios like eSports titles or high framerate games where Nvidia's CPU driver overhead becomes a problem. However, in productivity, thanks to the higher clock speeds, this will have a slight advantage.

The GPU is on parity for raw performance, however, holds the edge in raytracing and has the slightly superior upscaling tech in DLSS4. If you prefer Nvidia's software ecosystem or raytracing, this is the easy choice.

CPU AMD Ryzen 7 7700; **COOLER** Aftershock Glacier Mirror 360mm; **MOTHERBOARD** Gigabyte B650M Gaming Plus Wi-Fi; **GRAPHICS** Gigabyte RTX 5070Ti Eagle Ice 16GB; **MEMORY** 32GB Silicon Power XPOWER Storm DDR5 6000MHz RGB C36; **STORAGE** 2TB Gen4 Silicon Power US75 M.2. NVME SSD; **POWER SUPPLY** Inwin P85II 850W; **CASE** Gigabyte C102 Glass.

YOUR NEXT PC

BLUEPRINTS

Build the best PC for your budget

BUDGET
ADVANCED
MID-RANGE
NZXT

KEY

Budget build

Pick these parts if you want to build a new, well-rounded PC for a good price.

Mid-range build

For productivity power and running every new game at 1080p 60fps. This recommended build will see you through.

Advanced build

You're looking for the best PC on the market and superior components. But you still want to spend smart.

BUDGET BUILD

Enjoy 1080p gaming and most tasks without breaking the bank.

TOTAL

$1,781

MOTHERBOARD

B660M-HDV
Asrock $139
This is as cheap as we want to go while still offering room for expansion and upgrades down the line.

PROCESSOR

Core i5 13400F
Intel $225
With ten cores, six of them the Performance kind, this Raptor Lake Core i5 is fantastic value and a great all-rounder.

GRAPHICS CARD

Radeon RX 9060 XT 8 GB
AMD $499
AMD delivers what we need for a 1080p gaming PC at a solid price, at least until even more budget GPU competition arrives.

COOLER

Laminar RM1 (included with CPU)
Intel Free
There's room for an upgrade here, but on a budget the included CPU cooler will work just fine.

MEMORY

T-Force Vulkan Z 16GB
Teamgroup $59
8 GB of RAM is simply not enough these days, but 16 GB of speedy DDR4 is much more like it.

POWER SUPPLY

Pure Power 12 750W
Be Quiet! $179
This 750W power supply gives you a decent dose of headroom for some future upgrades, from a trusted manufacturer.

SSD

SN7100 1 TB
Western Digital $139
It's time to ditch SATA and go for an NVMe drive, even for a budget PC. You'll appreciate the extra speed and fast boot times.

CASE

NX200M
Antec $65
This Antec will let your components breathe and has space for further expansion and cooling.

DISPLAY

Mobiuz EX241
BenQ $270
This BenQ is proof you can buy an excellent 24in 1080p 220Hz gaming monitor for not a huge sum of cash nowadays.

KEYBOARD

C3 Pro Wired
Keychron $59
It's actually mind blowing what you can pick up for this little cash: a USB mechanical board that looks lovely.

MOUSE

G305 Lightspeed
Logitech $69
Even on a budget you can still grab a fantastic, ultra-rapid wireless squeaker like this one here.

HEADSET

HS55 Stereo
Corsair $59
CorsaIr's budget wired cans are comfy and have a surprisingly excellent microphone for the money.

MOUSE PAD

MM100
Corsair $19
A simple black rectangle that can make a world of difference over no-name models, and it's almost as cheap, too.

MID-RANGE BUILD

Our recommended build for solid productivity and playing the latest games.

TOTAL

$3,073

MOTHERBOARD

TUF Gaming B650-E
Asus $299
A reliable motherboard with plenty of frills, including Wi-Fi 6E, 2.5Gb Ethernet, PCIe 5.0 for the SSD and USB-C on the back.

PROCESSOR

Ryzen 7 7700X
AMD $529
For the longevity offered by the AM5 socket, we're going for AMD's excellent eight-core Ryzen 7.

GRAPHICS CARD

RTX 5060 Ti 16GB
NVIDIA $800
Nvidia's RTX 50-series cards have been hard to find for good prices, but this one's widely available, punchy and affordable.

COOLER

Peerless Assassin 120 SE
Thermaltake $55
It's a big beast, but it brings cooling performance to the table that's undeniably impressive.

MEMORY

Delta RGB 16GB 5600MHz
Team T-Force $89
It even has fancy RGB lighting, and this Patriot RAM certainly has the speed you need for less.

POWER SUPPLY

Pure Power 12 M 750W
Be Quiet! $179
This larger Be Quiet! PSU offers a stable platform with PCIe 5.0 connectivity. At 750W, there's room for a GPU upgrade too.

SSD

NM790 1TB
Lexar $119
The Lexar proves you can, sometimes, have it all: blazing speeds, cool operation and a great price.

CASE

H7
Nzxt $179
It's very clever of Nzxt to design such an easy PC case to build into, and make it look so gorgeous too.

DISPLAY

MPG 275CQRXF
MSI $479
The price of this MSI, considering the 1440p resolution, curve and 240Hz refresh rate, is quite something.

KEYBOARD

K855 Wireless TKL
Logitech $119
You could spend more for a full-size keyboard, but this mechanical Logitech will certainly suffice for most people.

MOUSE

DeathAdder V2
Razer $59
This Razer mouse is a superb companion for competitive gaming without breaking the bank.

HEADSET

Cloud Alpha
HyperX $140
We're still not over the awesome audio quality and excellent comfort of the HyperX Cloud Alpha.

MOUSE PAD

G440
Logitech $27
This low-friction hard-top mouse pad with minimal branding offers the smoothest of glides for a reasonable price.

ADVANCED BUILD

Go above and beyond with a PC powerful enough to tackle anything.

TOTAL
$8,919

MOTHERBOARD

MAG X870E Tomahawk

MSU **$569**

With support for four M.2 drives, huge amounts of DDR5, Wi-Fi 7 and more, this mega mobo is specced to the hilt.

PROCESSOR

Ryzen 7 9800X3D

AMD **$889**

The top-tier Zen 5 X3D models will have more cores, but for gaming and most uses this is the bee's knees.

GRAPHICS CARD

GeForce RTX 5080

Nvidia **$2,500**

The RTX 5090 is ridiculously expensive, so we're recommending the RTX 5080 instead, but if you can afford a 5090 go for it.

COOLER

Galahad II Trinity 360

Lian Li **$249**

Lian Li's Galahad is all about pure liquid cooling performance and it delivers this flawlessly.

MEMORY

Trident Z5 RGB (2x16GB) 6000MHz

G.Skill **$159**

This is a new memory standard for a new era of memory speed. DDR5 is blisteringly and fantastically quick.

POWER SUPPLY

Prime PX-1300

Seasonic **$499**

This PC is a thirsty beast, so you'd better give it a serious power supply – and this one's similarly monstrous.

BOOT DRIVE

NM790 4 TB

Lexar **$368**

With 4TB of storage, it's going to take one seriously big Steam library to get anywhere close to filling this drive up.

MOUSE PAD

Firefly V2 Pro

Razer **$169**

Do you need an RGB mouse mat? If it makes you feel any better it's excellent for flick shots.

CASE

5000D

Corsair **$189**

We swear this stylish mid-tower is bigger on the inside. It's the PC equivalent of the TARDIS.

DISPLAY

ROG Swift OLED PG32UCDM

Asus **$2,229**

You could be much more sensible on your screen than this. For this build, however, we only want the best.

KEYBOARD

ROG Strix Scope II 96 Wireless

Asus **$299**

We're keyboard snobs, and we can say with confidence that this full-sized Asus board is about as good as it gets.

MOUSE

NEW ENTRY

DeathAdder V4 Pro

Razer **$299**

The latest version of the DeathAdder isn't cheap, but when it comes to performance it's sensational.

HEADSET

Maxwell

Audeze **$499**

Planar magnetic drivers make this headset pure heaven for audio fans. And everyone else, to be honest.

WORKSHOPS & TIPS

Easy-to-follow workshops and expert tips

Workshops in this issue

90 Manage Windows' notifications
93 What's the fuss about: Bing Video Creator
94 Browser Tips
95 AI Tips: Store chat details for further reference
96 Make Windows Better
97 Make Office Better
100 Phone & Tablet Tips

Manage Windows notifications on your PC

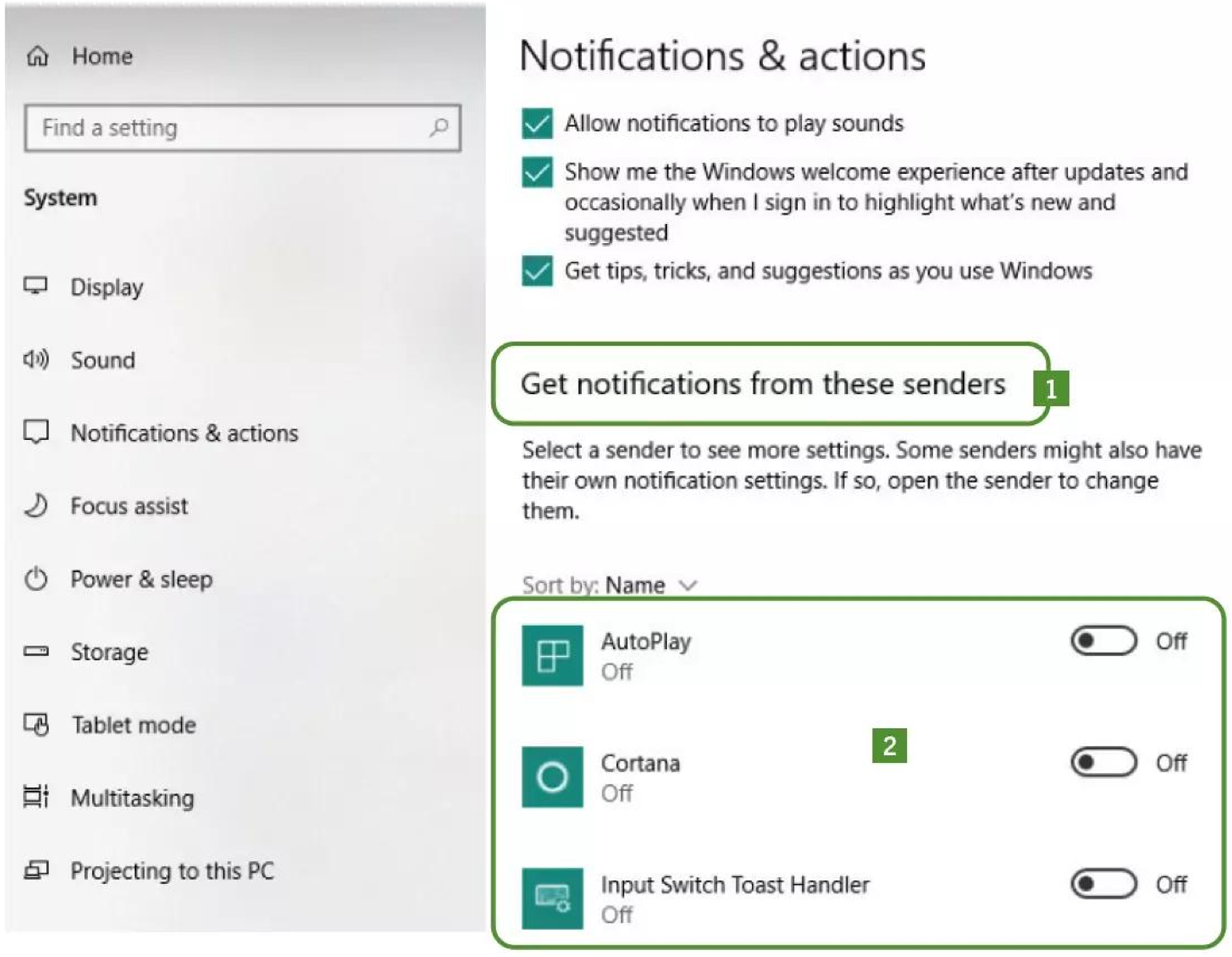
Tame the constant interruptions.

IT WILL TAKE
1 hour
YOU'LL NEED
Windows 11 or 10

Windows can sometimes feel a little needy. Whether it's popping up alerts, directing you to incoming messages or allowing random software to disturb your flow, its constant demands for attention can be distracting if not downright infuriating. Thankfully, you can tame these constant interruptions to ensure you see only those you want.

1 Turn off Windows notifications entirely

The most comprehensive option is to turn off Windows notifications completely. To do so in Windows 11, open Settings by pressing the Windows key+I, then click System, followed by Notifications. Turn off the slider in the Notifications block at the top of the screen (see screenshot below).



Notifications & actions

☑ Allow notifications to play sounds

☑ Show me the Windows welcome experience after updates and occasionally when I sign in to highlight what's new and suggested

☑ Get tips, tricks, and suggestions as you use Windows

Get notifications from these senders 1

Select a sender to see more settings. Some senders might also have their own notification settings. If so, open the sender to change them.

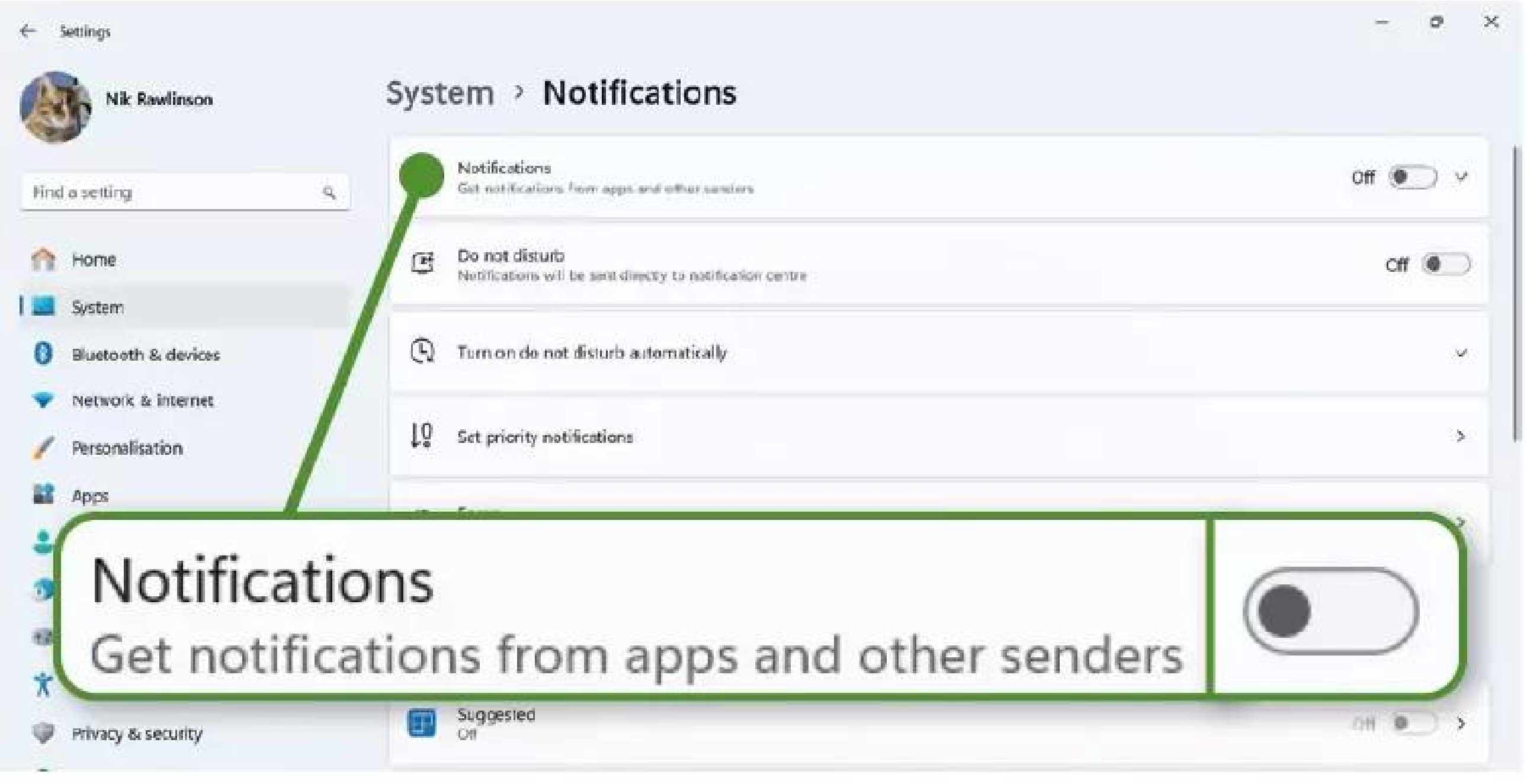
Sort by: Name

AutoPlay: Off — Off

Cortana: Off — Off 2

Input Switch Toast Handler: Off — Off

Turn off these sliders to disable app notifications in Windows 10.



System › Notifications

Notifications: Get notifications from apps and other senders — Off

Do not disturb: Notifications will be sent directly to notification centre — Off

Turn on do not disturb automatically

Set priority notifications

Suggested: Off

The quickest way to silence your notifications is to turn them all off across Windows.

This is one of the settings that changed between Windows 10 and 11. So, if you're using Windows 10, open Settings and click 'Notifications & actions' in the sidebar. Now click the slider below 'Get notifications from apps and other senders' so it turns off.

2 Turn off notifications for specific programs

If turning off all notifications is going too far for you, take a more selective approach by blocking specific programs. Again, the settings are slightly different in Windows 10 and 11.

In Windows 11, open Settings, click System, followed by Notifications, then scroll down to the section 'Notifications from apps and other senders'. Click the sliders for the programs you want to silence so they're off.

If you're using Windows 10, scroll down from the 'Get notifications from apps and other senders' setting, to 'Get notifications from these senders' (1 in our screenshot above). Here, turn off the sliders beside any programs you don't want to hear from 2.

HOW I MANAGE MY NOTIFICATIONS

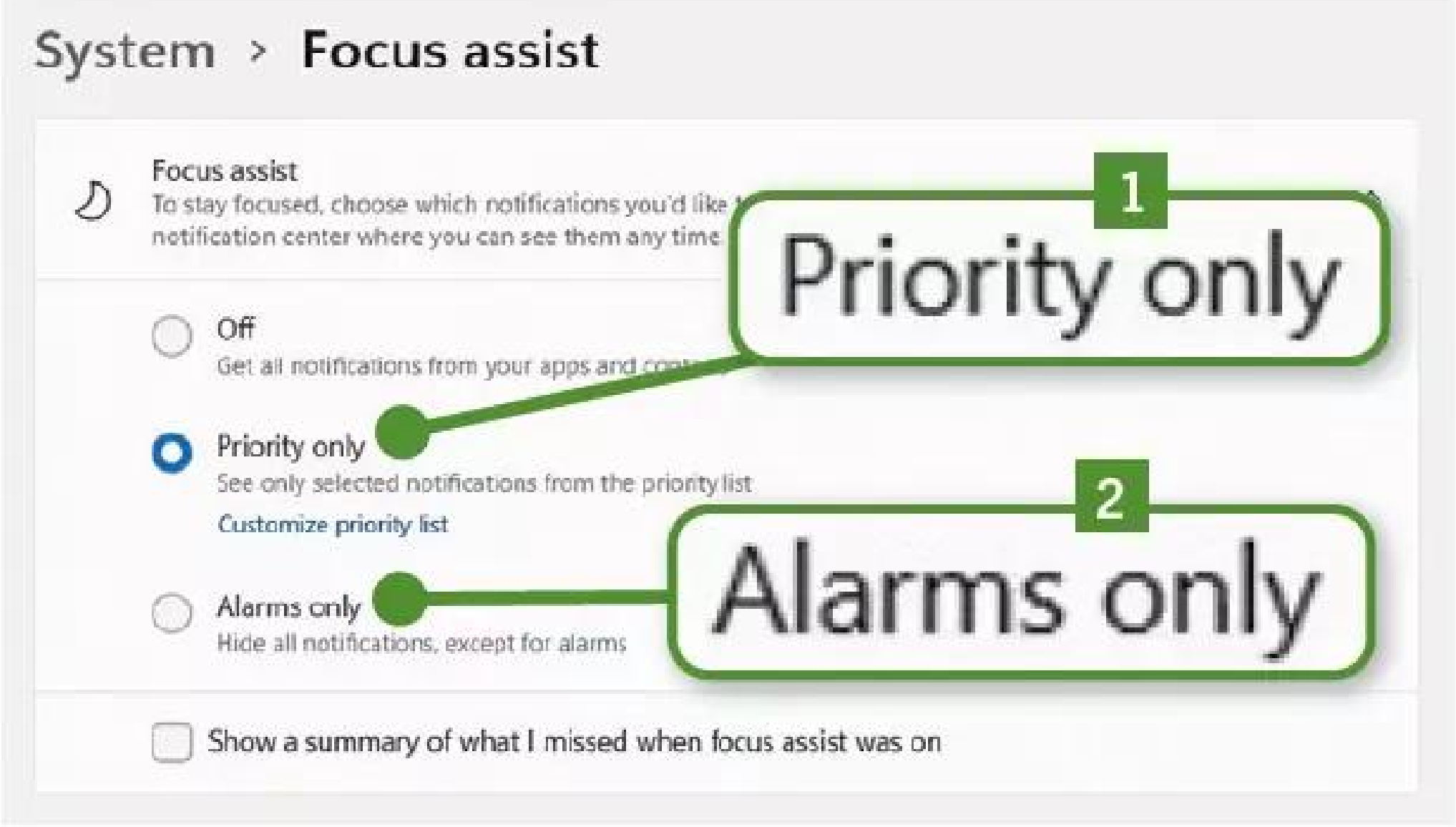
I've turned off all notifications for all programs, across all my computers (Windows, Linux and Mac). I've done this because I prefer to check manually to see if any software needs my attention. That way, I can turn to it when I'm ready to deal with whatever is waiting. This is true whichever of my machines I'm using. I've also turned off almost all notifications on my phone and, in particular, those that deal with social media.
Nik Rawlinson

3 Temporarily silence Windows notifications

When you turn off notifications entirely, whether for a single program or Windows as a whole, you risk missing important alerts. However, even if you elect to keep some notifications, it's still annoying when they pop up while you're trying to focus on some important work, play a game or stream a TV programme. In these instances, Windows 10 users can use Focus Assist to temporarily switch them off – and later restore them – without diving into the full Settings program.

Open the Action Centre by pressing the Windows key+A. When it appears, click 'Focus assist' or 'Quiet hours' (Microsoft renamed 'Quiet hours' as 'Focus assist' in a 2018 update). If neither option appears but you see a down-pointing arrow, click this to reveal it.

'Quiet hours' was in effect an all-or-nothing setting. But 'Focus assist' gives you options for 'Priority only' (1 in our screenshot above), which allows a limited number of programs and contacts to notify you, or 'Alarms only' 2, which silences everything except an alarm. You can cycle through these settings by clicking the 'Quiet hours' button.


System › Focus assist

Focus assist
To stay focused, choose which notifications you'd like ... notification center where you can see them any time.

○ Off
Get all notifications from your apps and contacts

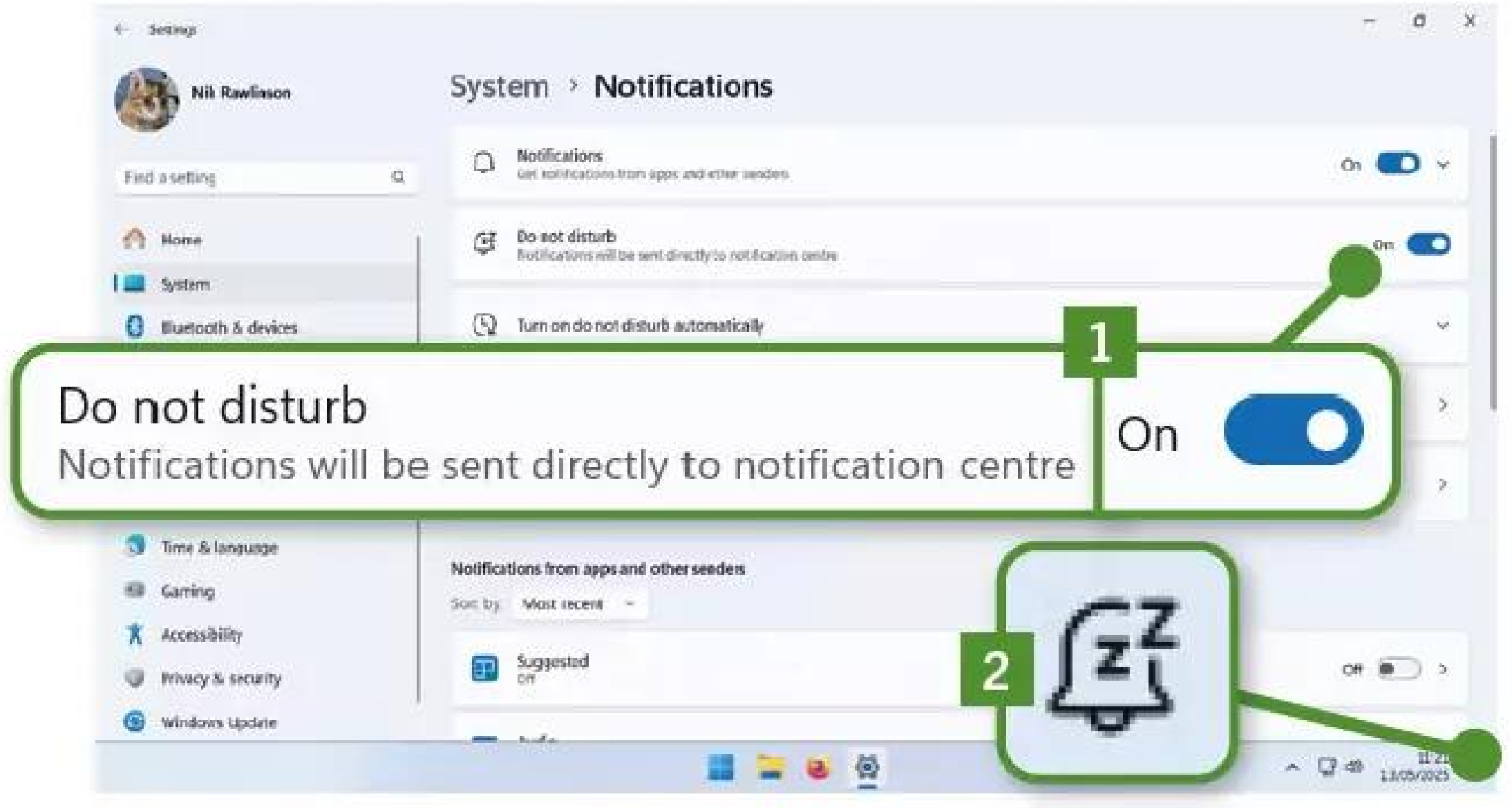
● Priority only
See only selected notifications from the priority list
Customize priority list

○ Alarms only
Hide all notifications, except for alarms

☐ Show a summary of what I missed when focus assist was on

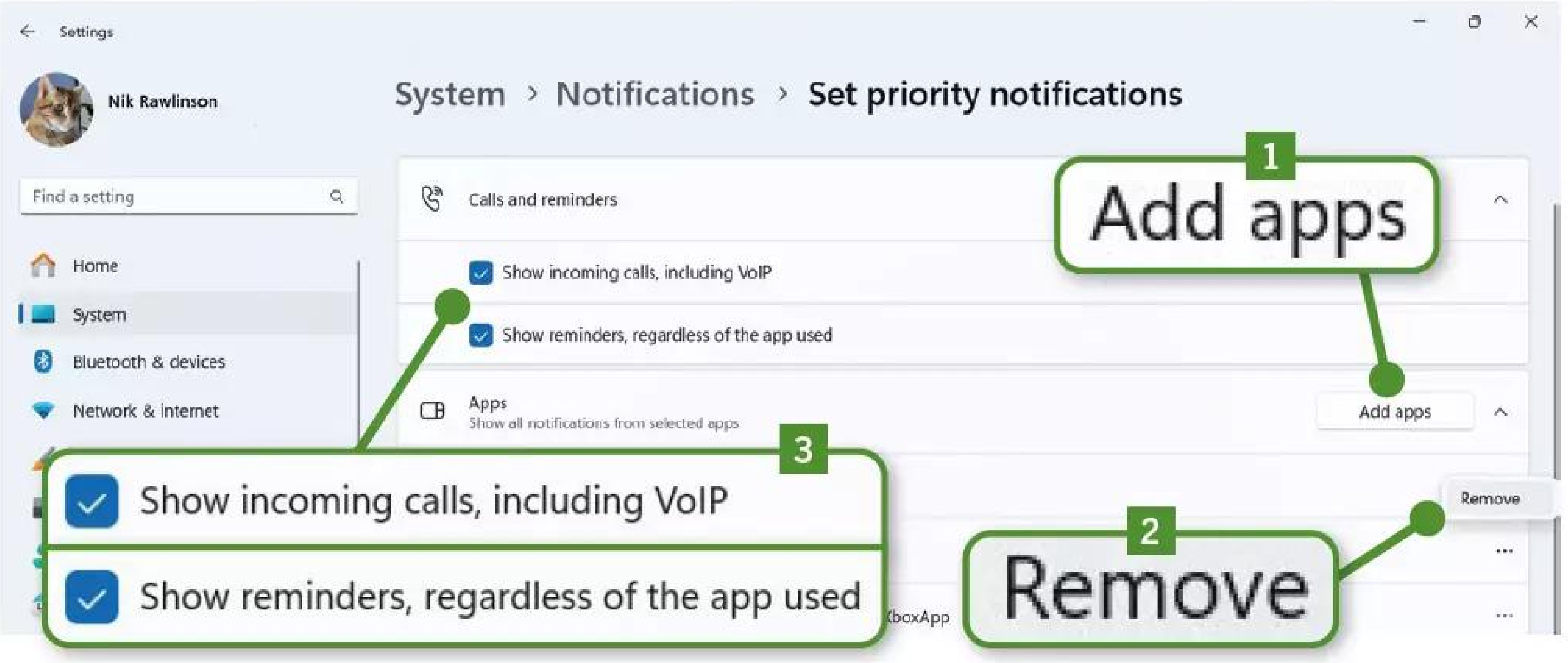
'Focus assist' in Windows 10 lets you pick a limited number of programs or just alarms.

In Windows 11 Microsoft replaced 'Quiet hours' with 'Do not disturb'. To find this, open Settings (Windows key+I), then click System, followed by Notifications, and turn on the slider beside 'Do not disturb' (1 in screenshot below). You'll notice that a bell appears at the right-hand end of the taskbar, overlaid by two Zs 2. This indicates that notifications will be sent straight to the notification centre at the bottom right rather than shown on screen. To view them, click the bell.


System › Notifications

Do not disturb
Notifications will be sent directly to notification centre
On

Turn on 'Do not disturb' and alerts will be sent to the notification centre.


System › Notifications › Set priority notifications

Calls and reminders
☑ Show incoming calls, including VoIP
☑ Show reminders, regardless of the app used

Apps
Show all notifications from selected apps

You can make notifications from some apps appear even if you've turned on 'Do not disturb'.

> "If turning off all notifications is going too far for you, take a more selective approach by blocking specific programs."

This option is more flexible than you might initially think, because you can set Windows to allow a limited number of notifications to appear, rather than having them all sent straight to the notification centre. To specify which alerts will appear, scroll down to and click 'Set priority notifications'. You'll see that some programs already have the right to interrupt you, but you can include others by clicking 'Add apps' (1 above), and remove any you don't want to hear from by clicking the three dots to the right of their name, followed by Remove 2.

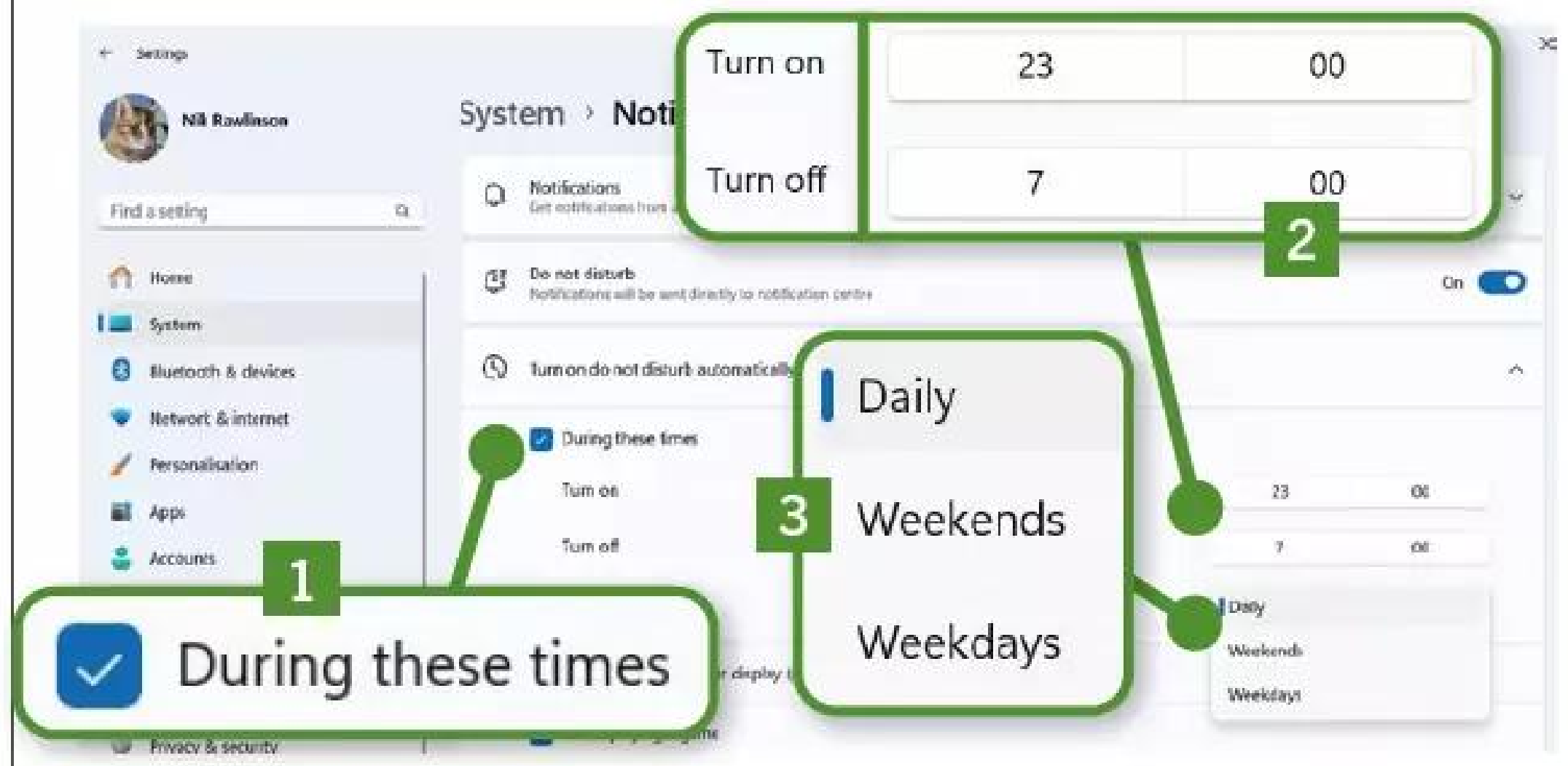
Two options at the top of the list allow incoming calls and reminders 3 to get through. Untick the checkboxes beside them to remove these permissions.

4 Schedule notifications to turn off automatically

It doesn't take much effort to turn on either 'Do not disturb' or 'Focus assist', but you might still want to automate the process – especially if you tend to leave your computer switched on around the clock.

In Windows 11, while still in the Notifications section of Settings, click 'Turn on do not disturb automatically', then tick the box beside 'During these times' (1 in our screenshot below). Now use the hour and minute boxes to the right of 'Turn on' and 'Turn off' to set the period during which you don't want to be disturbed 2. By default, your settings will apply every day, but you can change this to either weekends or weekdays by clicking the Daily dropdown menu to the right of Repeat and selecting the appropriate option 3.

There are also four preset 'Do not disturb' scenarios that you can apply for specific situations. These are listed immediately under your preset times. They apply when duplicating your screen (a common business scenario during


Turn on 23 00
Turn off 7 00

☑ During these times

Daily
Weekends
Weekdays

You can set Windows 11 to turn on 'Do not disturb' automatically at set times.

Which notifications should you keep on?

The answer to this question will be different for everyone. Generally we'd recommend allowing your email software to tell you when new messages arrive. However, you can cut the number of interruptions, perhaps by reducing how often it checks the server for new messages. Would it really matter, for instance, if it checked once an hour, rather than every five minutes? You can always check manually if you're expecting an important message.

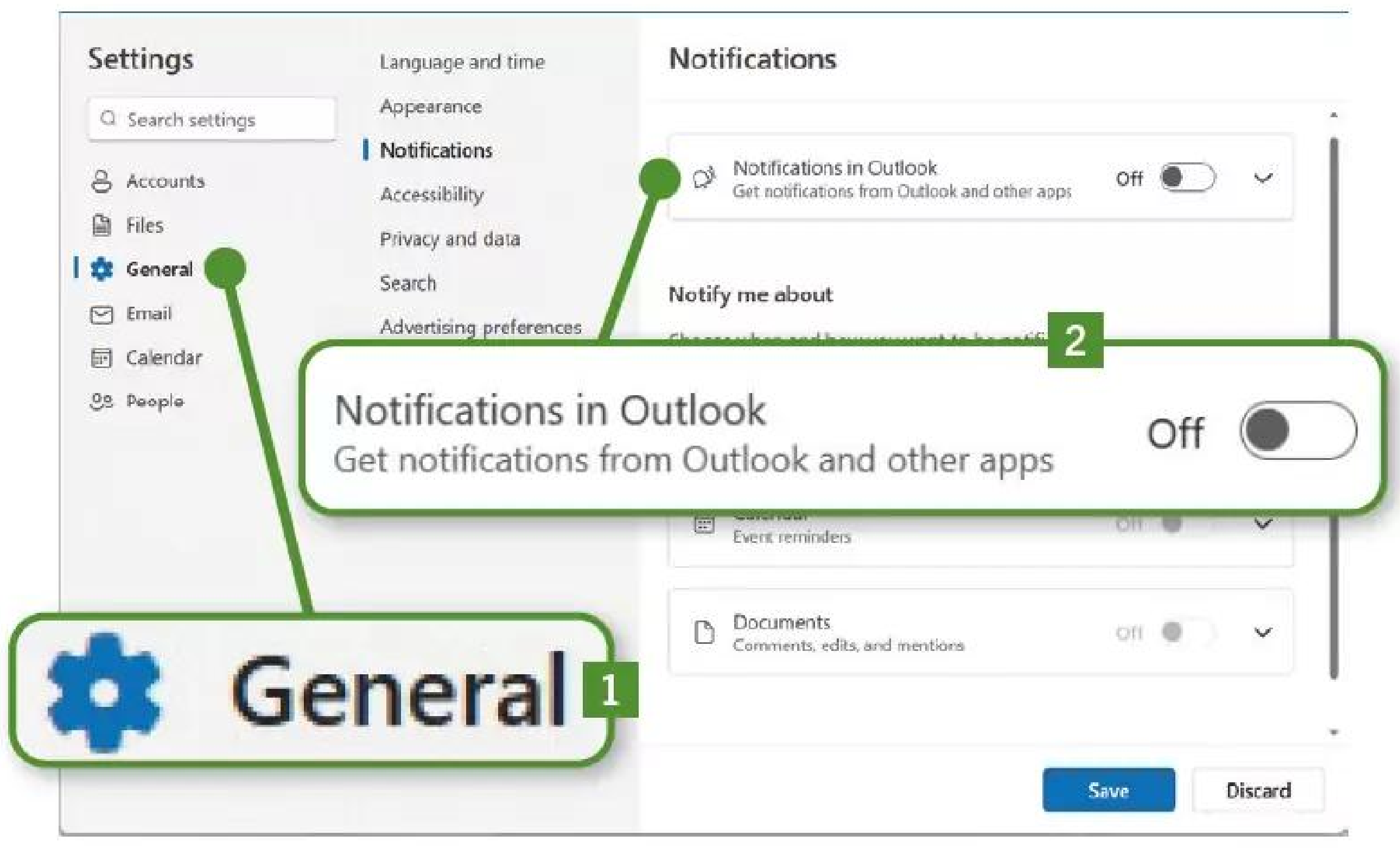
If you do decide to turn off email notifications, how you do so depends on which program you use to manage your email. If you're using Thunderbird, click the three lines on the right of the menu bar and select Settings. Next click General in the sidebar, then scroll down to 'Incoming mails' and untick both 'Show an alert' and 'Play a sound'.

To turn them off in the new version of Outlook, click the gear icon on the program title bar, then General (1 in our screenshot above right), followed by Notifications. Now turn off the slider beside 'Notifications in Outlook' 2. If you don't want to suppress all Outlook notifications, use the individual Mail, Calendar and Documents options to deactivate them one by one.

Chat programs, on the other hand, should probably be allowed to notify you as soon as a new message comes through. This type of communication is more conversational, so it requires a faster response.

Several Windows notifications provide general information, and you can safely turn these off if you don't find them useful. For example, open Settings and tap System followed by Notifications, then expand the 'Additional settings' section. Here, you can deactivate options for showing the Windows welcome experience after significant updates, ways to get more out of Windows, and general tips and suggestions (see screenshot above). If you're already familiar with Windows, you can probably manage without these.

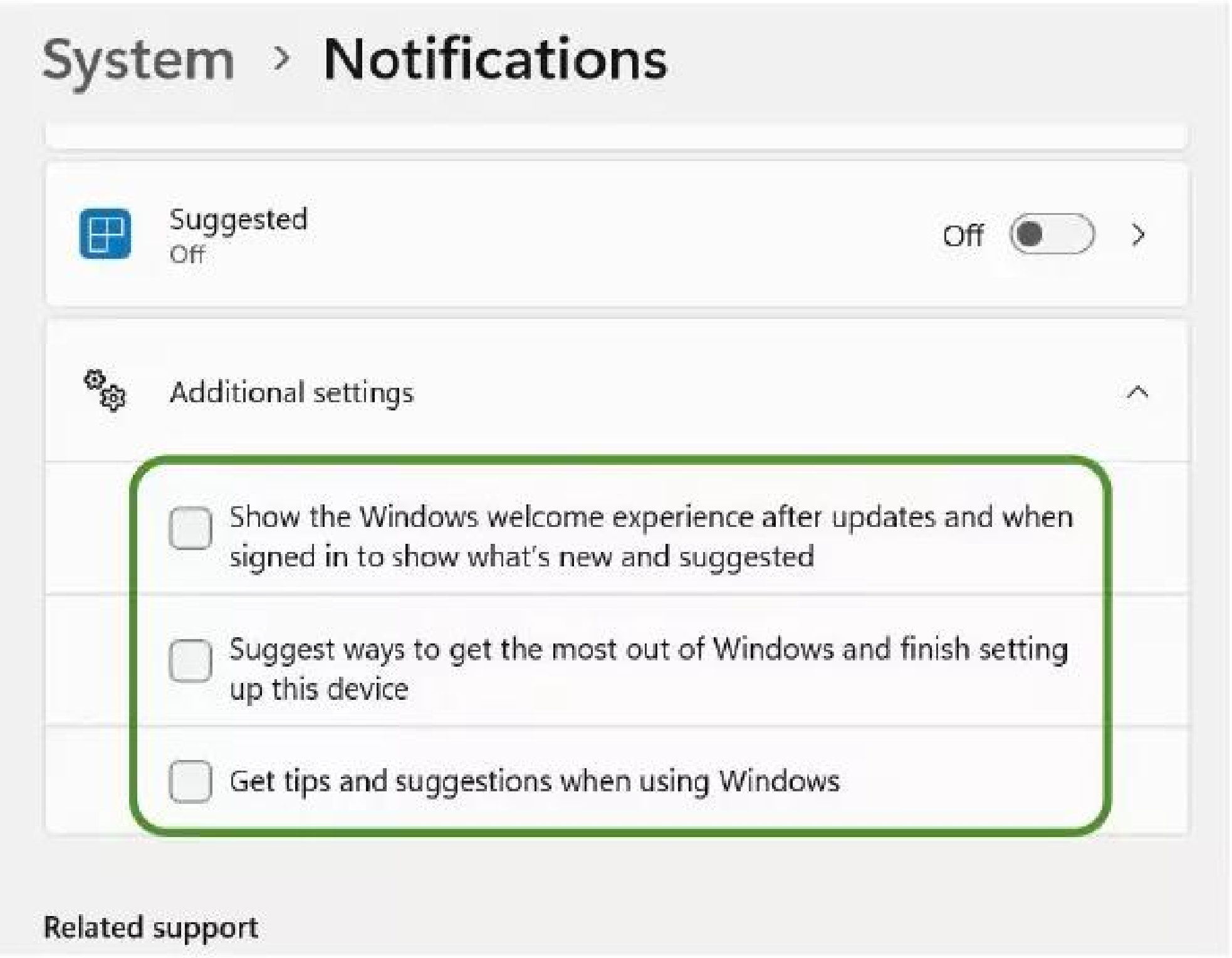
We advise that you don't switch off update alerts, notifications from Microsoft Defender/Windows Security or battery-saver messages on laptops.



Notifications in Outlook
Get notifications from Outlook and other apps Off

Calendar
Event reminders Off

Documents
Comments, edits, and mentions Off



Suggested
Off Off

☐ Show the Windows welcome experience after updates and when signed in to show what's new and suggested

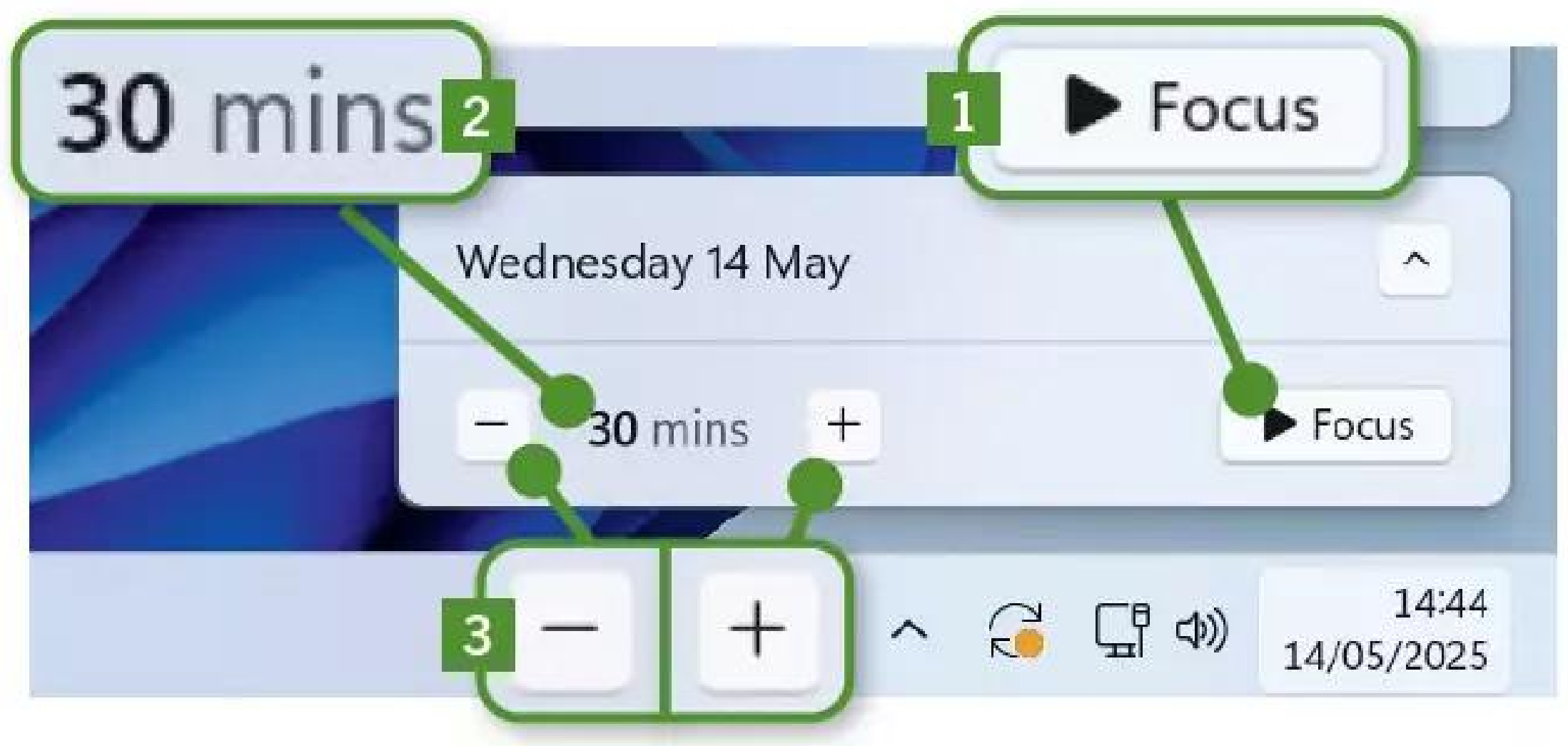
☐ Suggest ways to get the most out of Windows and finish setting up this device

☐ Get tips and suggestions when using Windows

> "One compromise you might find useful is to keep notifications on but switch off the sounds they make when they appear."

which notifications could be an inconvenience), when playing a game, when using a program full-screen, and during the first hour after a significant Windows update session. You can opt out of any of these by unticking the box to the left.

You can do the same thing with 'Focus assist' in Windows 10. Press Windows key+I to open Settings, then click System, followed by 'Focus assist'. Now turn on the 'During these times' slider in the 'Automatic rules' section, and use the 'Start time' and 'End time' settings to specify the period when 'Focus assist' should automatically kick in. You can also choose which days it should apply, and which kinds of notifications you would still like to receive during those periods.



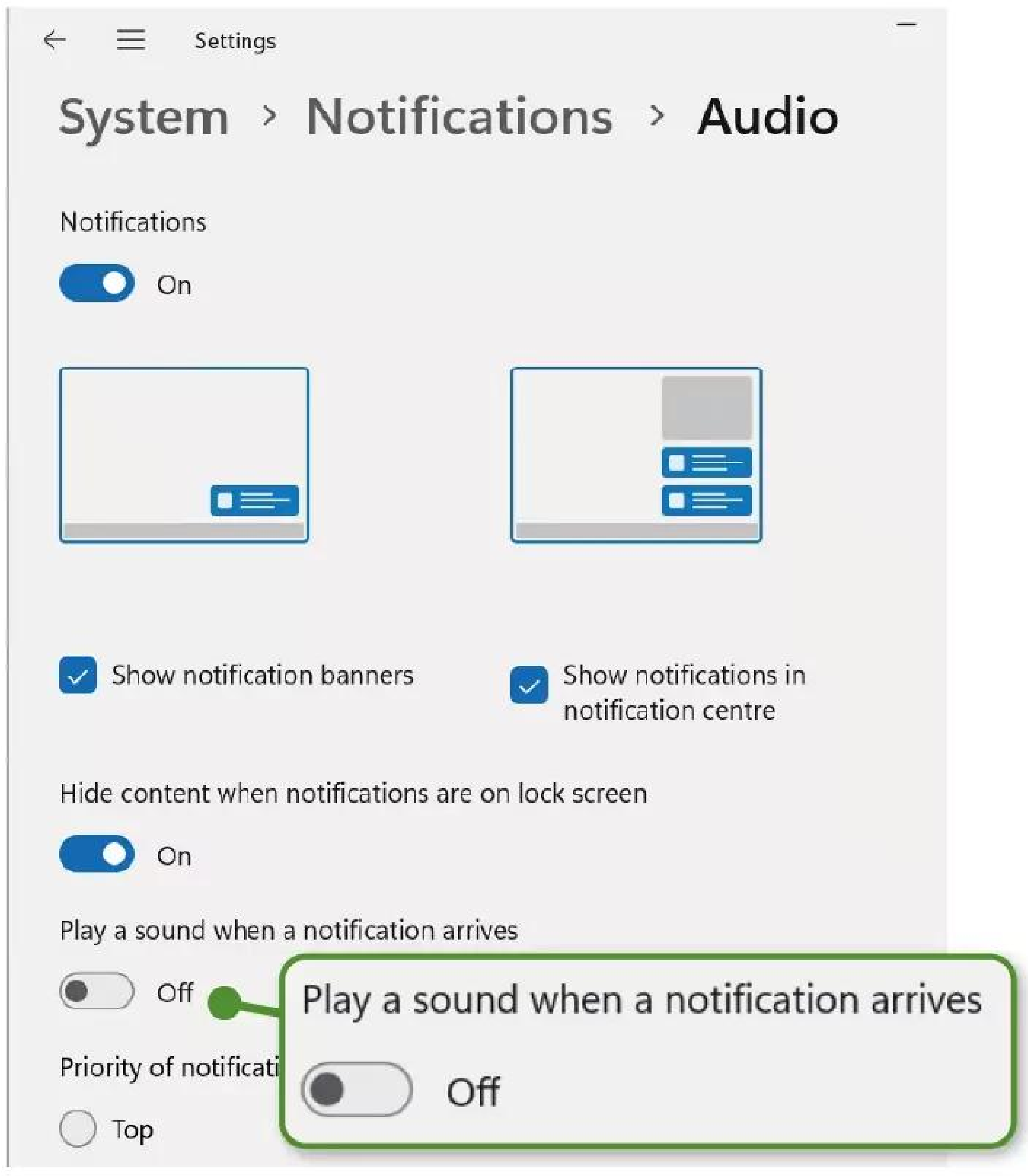
You can start a Focus session in Windows 11 from the notification area.

5 Start a focus session

With Windows 11, Microsoft introduced the concept of focus sessions. These are specific periods during which 'Do not disturb' is activated and flashing badges for apps on the taskbar are temporarily switched off to reduce distractions.

To start a focus session, press the Windows key+N to open the notifications area, then click the Focus button at the bottom right (1 in our screenshot below left). Our computer is set to run Focus sessions of 30 minutes 2, but you can tailor this to your own requirements by pressing the '-' and '+' buttons 3.

You can access the complete range of focus session settings through the Settings app. Press the Windows key+I, then click System followed by Focus. Here you can change the default session length, as well as what is suppressed during a session. You'll notice that one of the options is to 'Show the timer in the Clock app'. To see how this works, open the Clock app, then click the 'Focus sessions' icon at the top left, followed by 'Start focus sessions'. You can add breaks in the 'Get ready to focus' section, during which you'll be able to catch up on any notifications that were silenced during the session.



Notifications
On

☑ Show notification banners ☑ Show notifications in notification centre

Hide content when notifications are on lock screen
On

Play a sound when a notification arrives
Off

Priority of notificati

Play a sound when a notification arrives
Off

You can keep notifications on but turn off sounds when they appear.

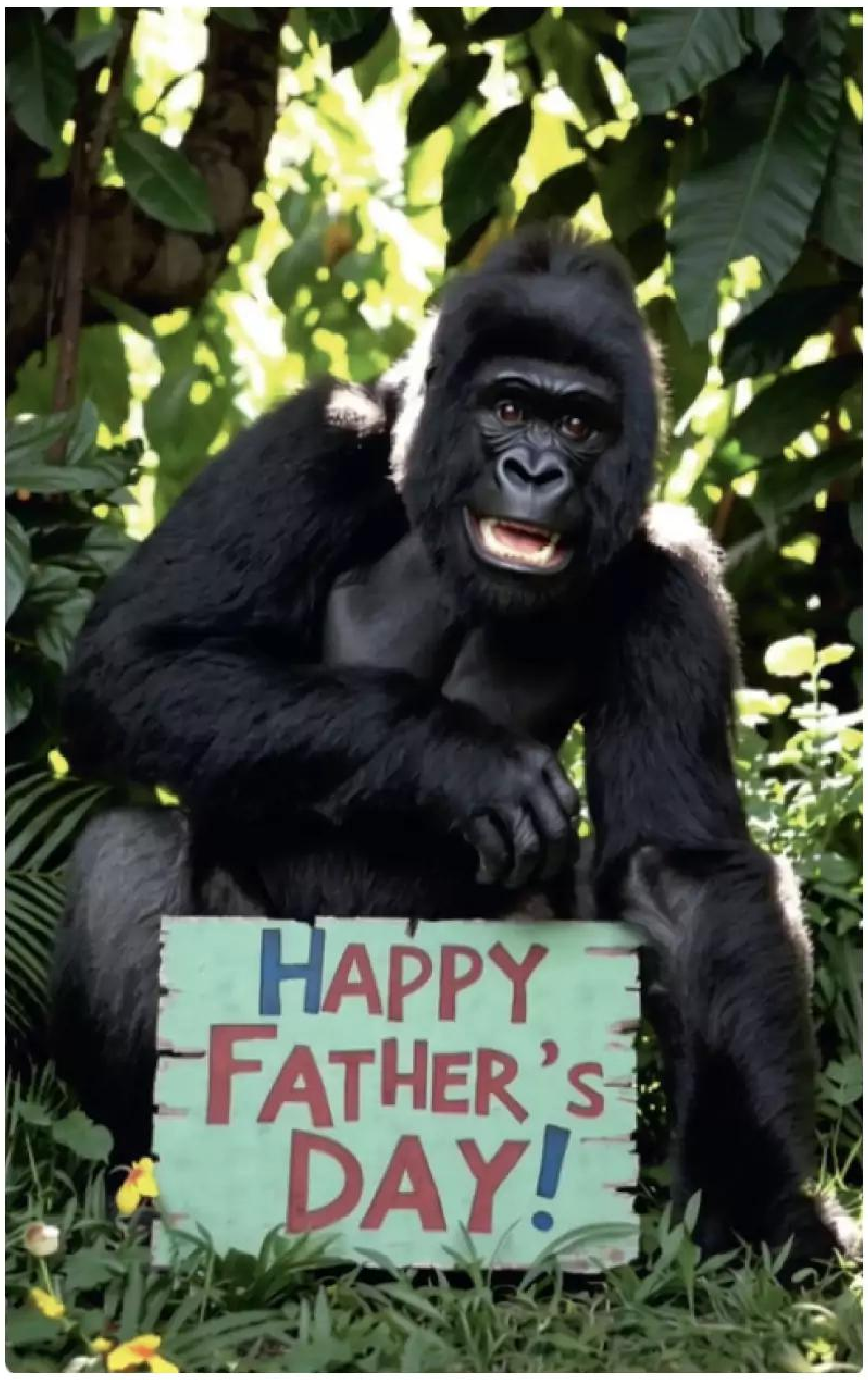
6 Mute notification sounds

One compromise you might find useful is to keep notifications on but switch off the sounds they make when they appear. While you could do this by muting your speakers, that would also mean you couldn't hear music or streamed videos. Instead, open Settings then click System followed by Notifications. Now click Audio and then, on the following screen, turn off 'Play a sound when a notification arrives' (see screenshot above). ■

What's the fuss about...

Bing Video Creator

Microsoft's new app lets you use one of the best AI tools for free.


HAPPY FATHER'S DAY!

What is it?

Microsoft's new AI tool for generating and sharing five-second videos based on what you type. Videos are created in 9:16 aspect ratio (with 16:10 coming soon) and are saved for 90 days. It's powered by Sora, the much-hyped video-generating tool from OpenAI, the company behind ChatGPT. Microsoft gushes that Bing Video Creator "empowers anyone to turn their words into wonder through an AI-generated video".

And does it do that?

Well, it depends what you type. First though you need to install the Microsoft Bing Search app on your phone (a desktop PC version is coming soon). Visit **bingapp.microsoft.com/bing** then either click the links to go to the Apple App Store (iPhone) or Google Play Store (Android), or scan the QR code. Open the app, then tap the bottom-right square icon followed by Video Creator. Now type a description of the video you want. You can also type directly into the Bing mobile app search bar, "Create a video of...".

Will it generate anything I type?

No, it won't create sexual, violent or harmful content, nor videos featuring real people. But it's pretty good at more innocent or surreal descriptions. On its blog (**tinyurl.com/APC550bing**) Microsoft shows a video for the prompt "In a busy Italian pizza restaurant, a small otter works as a chef and wears a chef's hat and an apron. He kneads the dough with his paws and is surrounded by other pizza ingredients." Sure enough, it's a small otter wearing a chef's hat kneading dough while making a pizza (pictured right).

But when would I ever need to create that?

Perhaps if you open a pizza restaurant and want to advertise for part-time otter chefs? It's a frivolous example, but Microsoft does give rather more useful ones, such as a fish wearing a party hat (also pictured). There are worse ways to wish someone a happy birthday. Like all AI tools though, getting it right takes some trial and error.

Did it work for you then?

Eventually. When we asked for a "Cheerful chimp wishing you a happy father's day", the card it was holding said only "happy day". We tried "merry monkey" and "beaming baboon" before finally striking gold with "grinning gorilla". It even got the apostrophe right (pictured above), which we weren't expecting. By then though we were running out of free 'Fast' creations.

So there's a limit?

Yes – you're only allowed 10 'Fast' videos when you first install the app and sign into your Microsoft account. These are created within "just a few minutes". After that you're stuck with 'Standard' videos, which Microsoft says takes "approximately several hours per video".

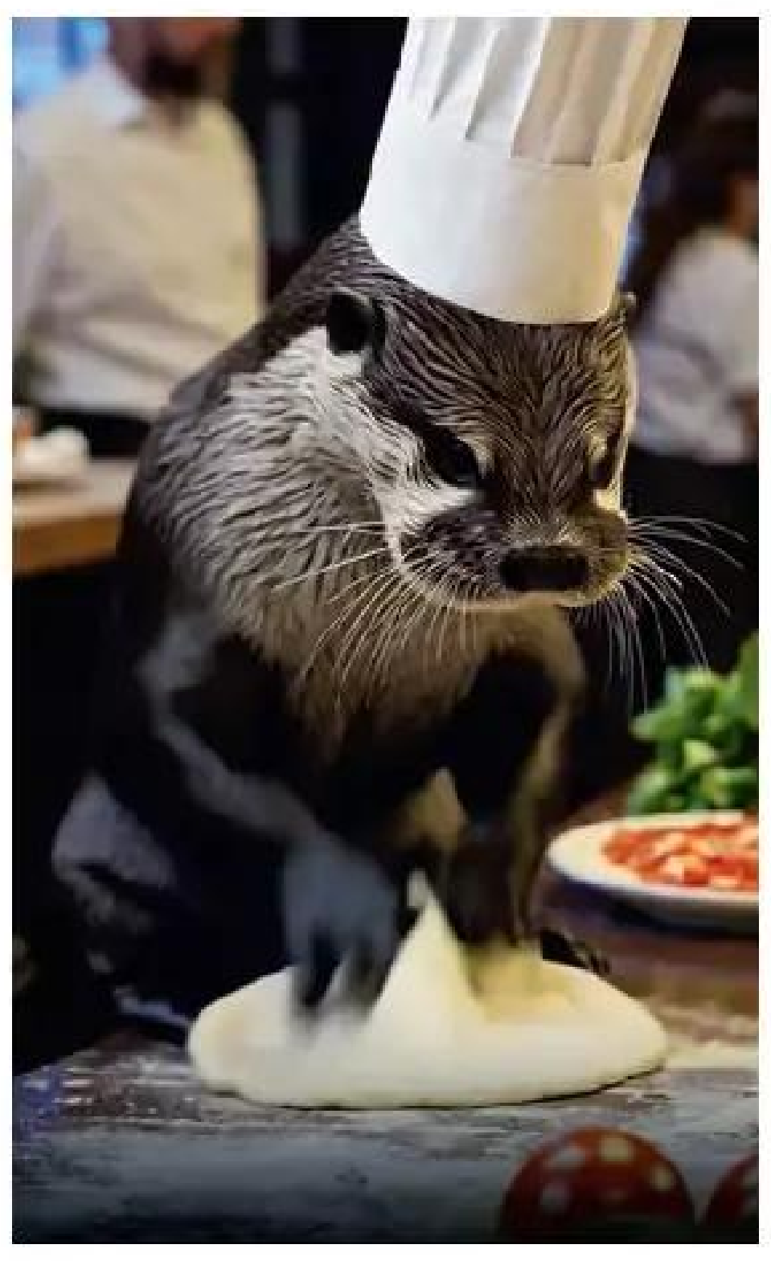
How long?

Long enough to lose the will to live while you wait. But Microsoft might be doing itself a disservice because when we tried the app it created our Standard videos almost as quickly as the fast ones. And you can 'buy' a Fast video by spending 100 Microsoft Reward points (see **www.microsoft.com/en-us/rewards/about**), earned by completing quizzes and daily tasks.

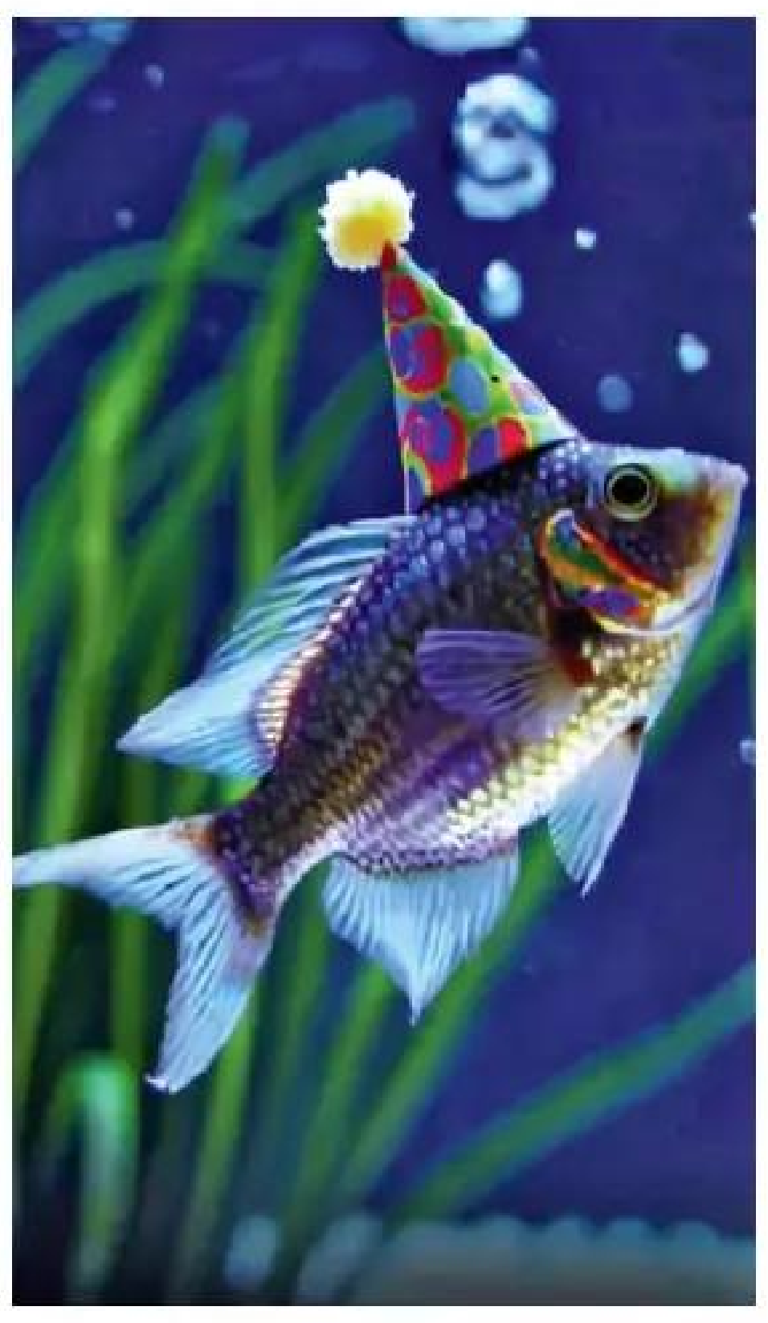
Ah, so it's just an exercise to get people to use Rewards?

Partly – and to encourage people to install the Bing app. But it's also the only place you can try Sora for free, and that's the true value of the tool. Previously to use Sora you had to pay around $20 a month for a ChatGPT subscription. For that money, we'd want a real otter to come and cook us a margherita. ■

> "We tried "merry monkey" and "beaming baboon" before finally striking gold with "grinning gorilla""



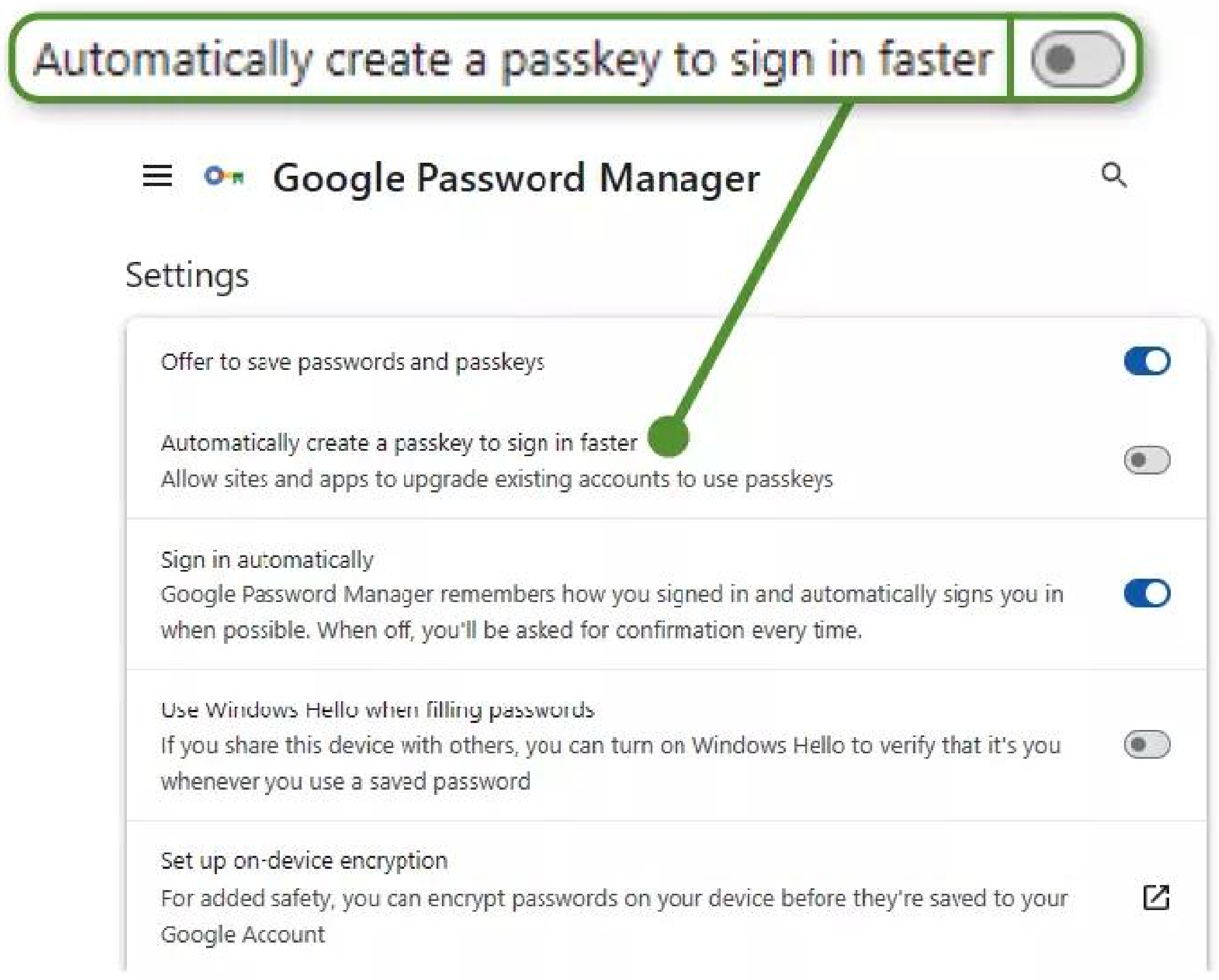
Bing is very adept at creating a pizza-making otter...



...and a fish getting in the mood for partying.

Browser tips

Secret settings and best extensions.



Google Password Manager

Settings

Offer to save passwords and passkeys

Automatically create a passkey to sign in faster
Allow sites and apps to upgrade existing accounts to use passkeys

Sign in automatically
Google Password Manager remembers how you signed in and automatically signs you in when possible. When off, you'll be asked for confirmation every time.

Use Windows Hello when filling passwords
If you share this device with others, you can turn on Windows Hello to verify that it's you whenever you use a saved password

Set up on-device encryption
For added safety, you can encrypt passwords on your device before they're saved to your Google Account

CHROME

Upgrade your passwords to passkeys

Chrome 136 (released in May) adds a useful option to the browser's password manager to help protect your online accounts. It automatically upgrades your passwords to passkeys, so you can sign into websites more quickly and securely using your fingerprint, face or other screen-lock method.

This only works on sites that support passkeys, which you've recently signed into using a saved password. The site will confirm a passkey has been created (you can still sign in using a password) and save it to Chrome's password manager.

The new option is enabled by default, but if you'd rather stick solely with passwords you can turn it off. Click Chrome's three-dot menu button and choose Settings, then 'Autofill and passwords'. Click 'Google Password Manager', select Settings and disable 'Automatically create a passkey to sign in faster' (see screenshot below).

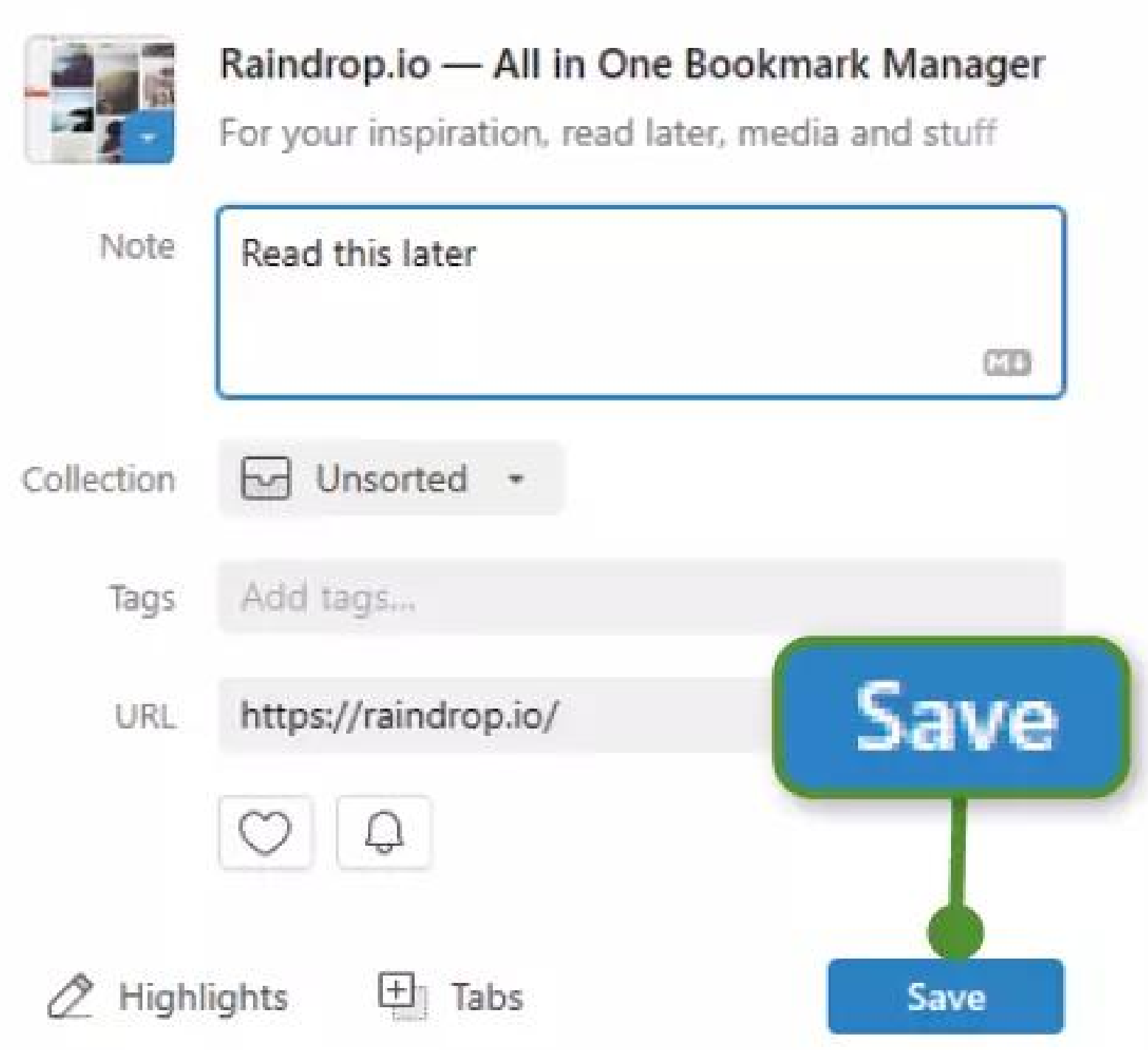
CHROMIUM & FIREFOX

Switch from Pocket to Raindrop.io

Mozilla closed its 'read it later' service Pocket on 8 July, and has removed the Pocket extension from its Add-ons store and the Chrome Web Store. Pocket was handy for saving interesting articles as you browsed the web, but Mozilla now wants to recommend content through Firefox's New Tab page.

The best alternative to Pocket is Raindrop.io (**raindrop.io/**), which similarly lets you save web pages, images, videos and PDFs for later (see screenshot below left). It has extensions for all the main browsers, as well as Android and iOS apps, so you can access your saved content from anywhere.

Raindrop.io is freemium, but its free plan includes all its essential features. You can import your data from Pocket before it disappears using the steps at **raindrop.io/integrations/pocket**.


Raindrop.io — All in One Bookmark Manager
For your inspiration, read later, media and stuff

Note: Read this later

Collection: Unsorted

Tags: Add tags...

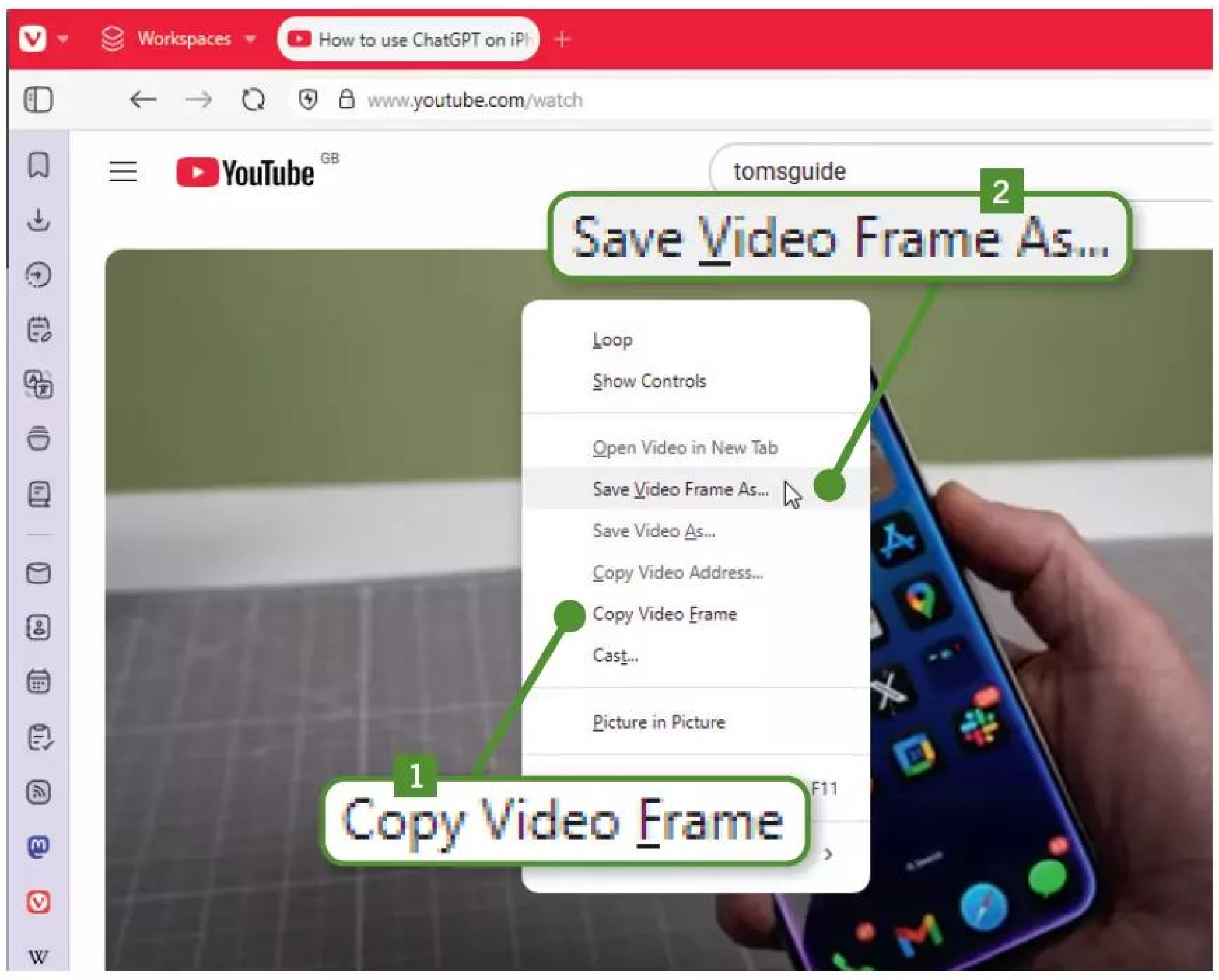
URL: https://raindrop.io/

Vivaldi

Capture screenshots of YouTube videos

Vivaldi 7.4, released in May, makes several improvements to the browser's interface to make it "lighter, cleaner and more intuitive". It also increases the maximum number of auto-complete suggestions in the address bar from 12 to 42.

To change the default, click Vivaldi's menu button and choose Settings, then Address Bar. Drag the Drop-Down Maximum Size slider to your preferred number of suggestions.



Best of all, Vivaldi 7.4 adds the option to capture screenshots of YouTube videos, as you can in Chrome and Edge. Right-click a YouTube video twice and select Copy Video Frame (1 in our screenshot) to save a screenshot of the current frame to your clipboard, to then paste into an image editor.

Alternatively, choose Save Video Frame As 2 to download the screenshot as a PNG file. You can change the file name to something more memorable.

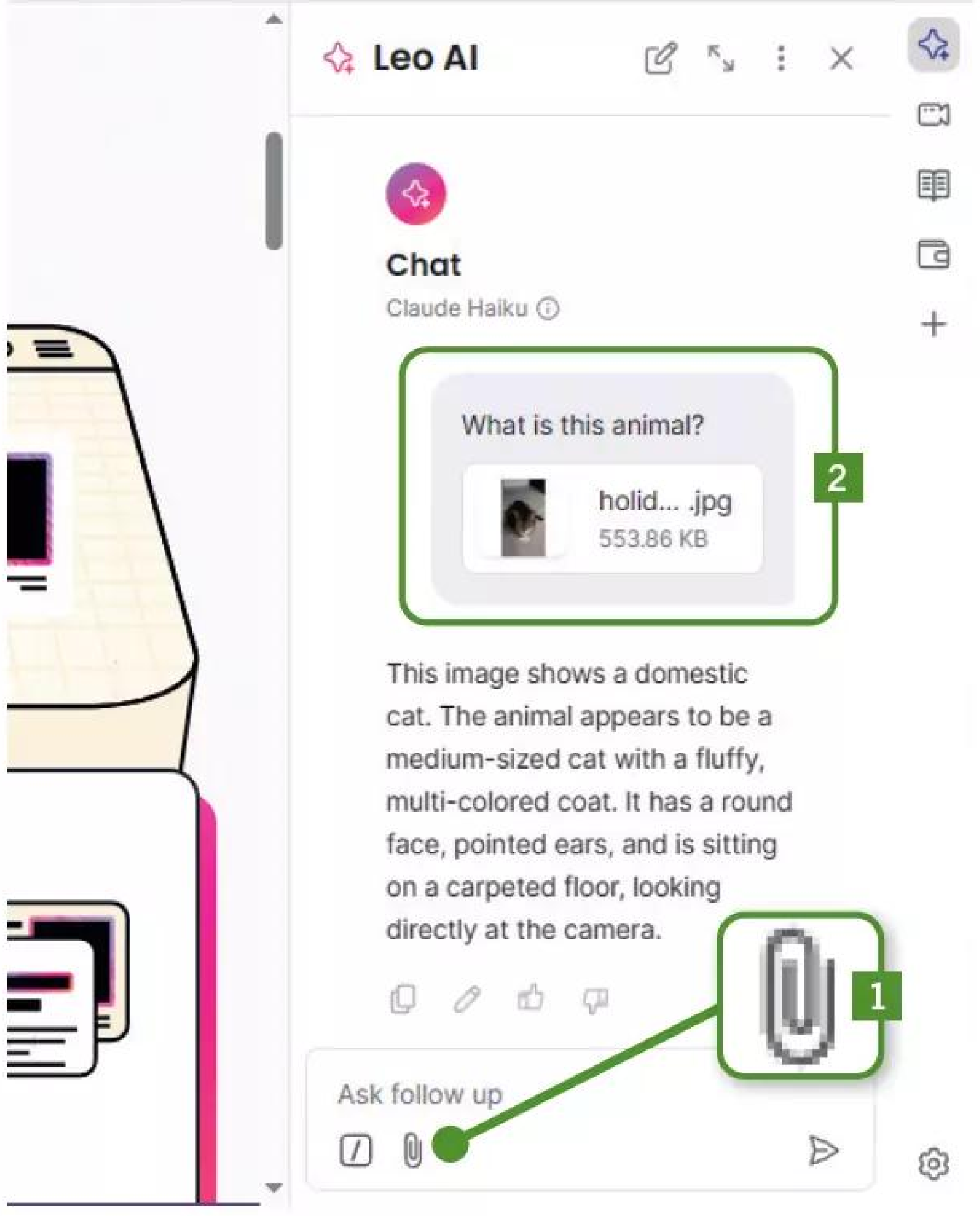
BRAVE

Upload images to Leo chats

Brave has updated its built-in AI assistant, Leo, with the option to upload images for analysis. This brings the tool closer in line with standalone chatbots such as ChatGPT and Gemini.

To use the new feature, open a chat window by clicking the Leo button on the browser's toolbar or sidebar. Click the attachment (paper-clip) icon (1 in our screenshot above) to select an image to upload – Leo supports PNG, JPEG and WEBP formats – and type your question 2.

Click the Send button and Leo will analyse the image and provide its answer. Unlike some chatbots, Leo can't edit or manipulate images. ■



What is this animal?

holid... .jpg
553.86 KB

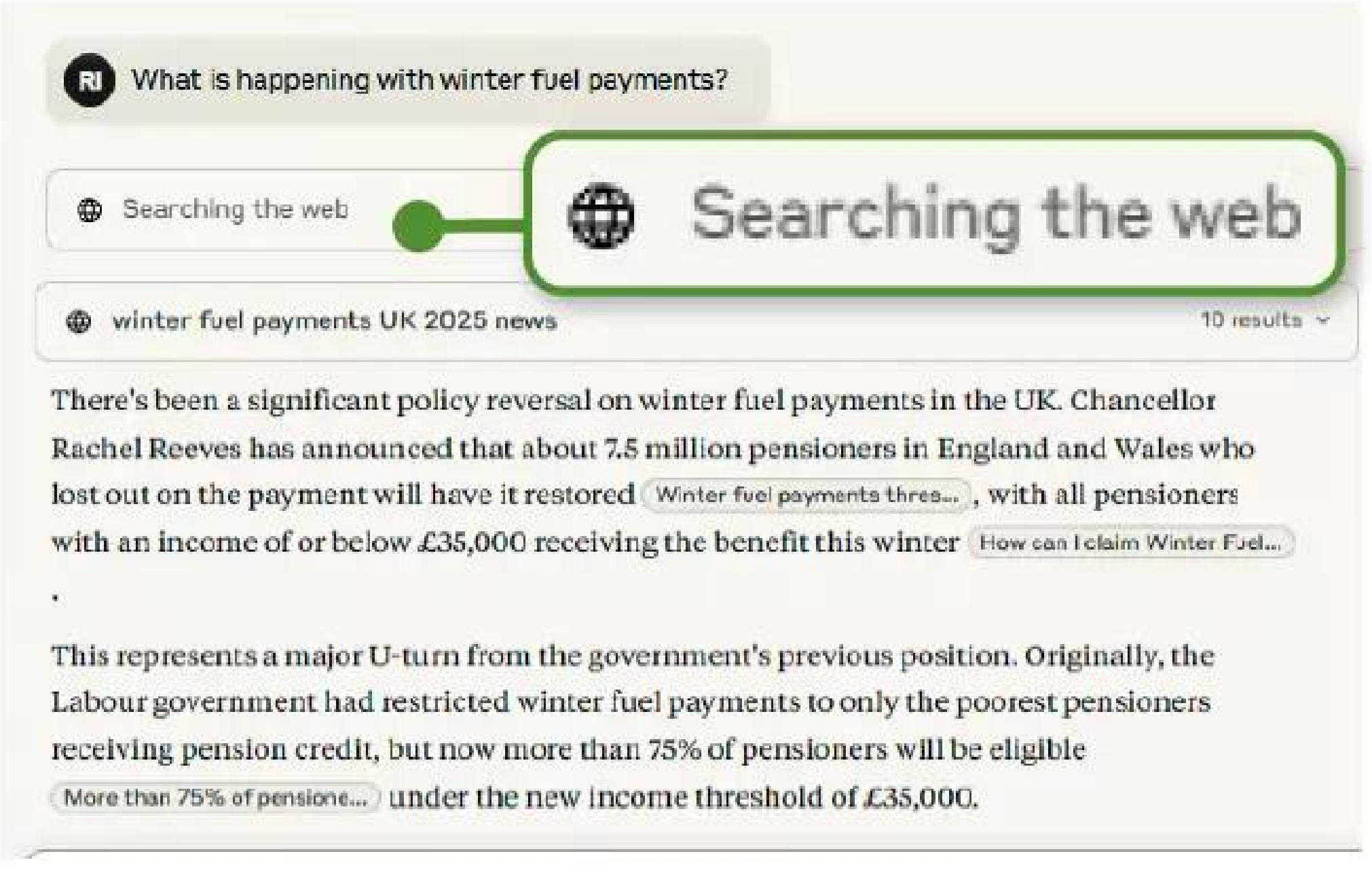
This image shows a domestic cat. The animal appears to be a medium-sized cat with a fluffy, multi-colored coat. It has a round face, pointed ears, and is sitting on a carpeted floor, looking directly at the camera.

Ask follow up

AI tips

NEW IN apc

Expert tips for a better experience.



What is happening with winter fuel payments?

winter fuel payments UK 2025 news — 10 results

There's been a significant policy reversal on winter fuel payments in the UK. Chancellor Rachel Reeves has announced that about 7.5 million pensioners in England and Wales who lost out on the payment will have it restored (Winter fuel payments three...), with all pensioners with an income of or below £35,000 receiving the benefit this winter (How can I claim Winter Fuel...).

This represents a major U-turn from the government's previous position. Originally, the Labour government had restricted winter fuel payments to only the poorest pensioners receiving pension credit, but now more than 75% of pensioners will be eligible (More than 75% of pensione...) under the new income threshold of £35,000.

CLAUDE

Search the web for up-to-date information

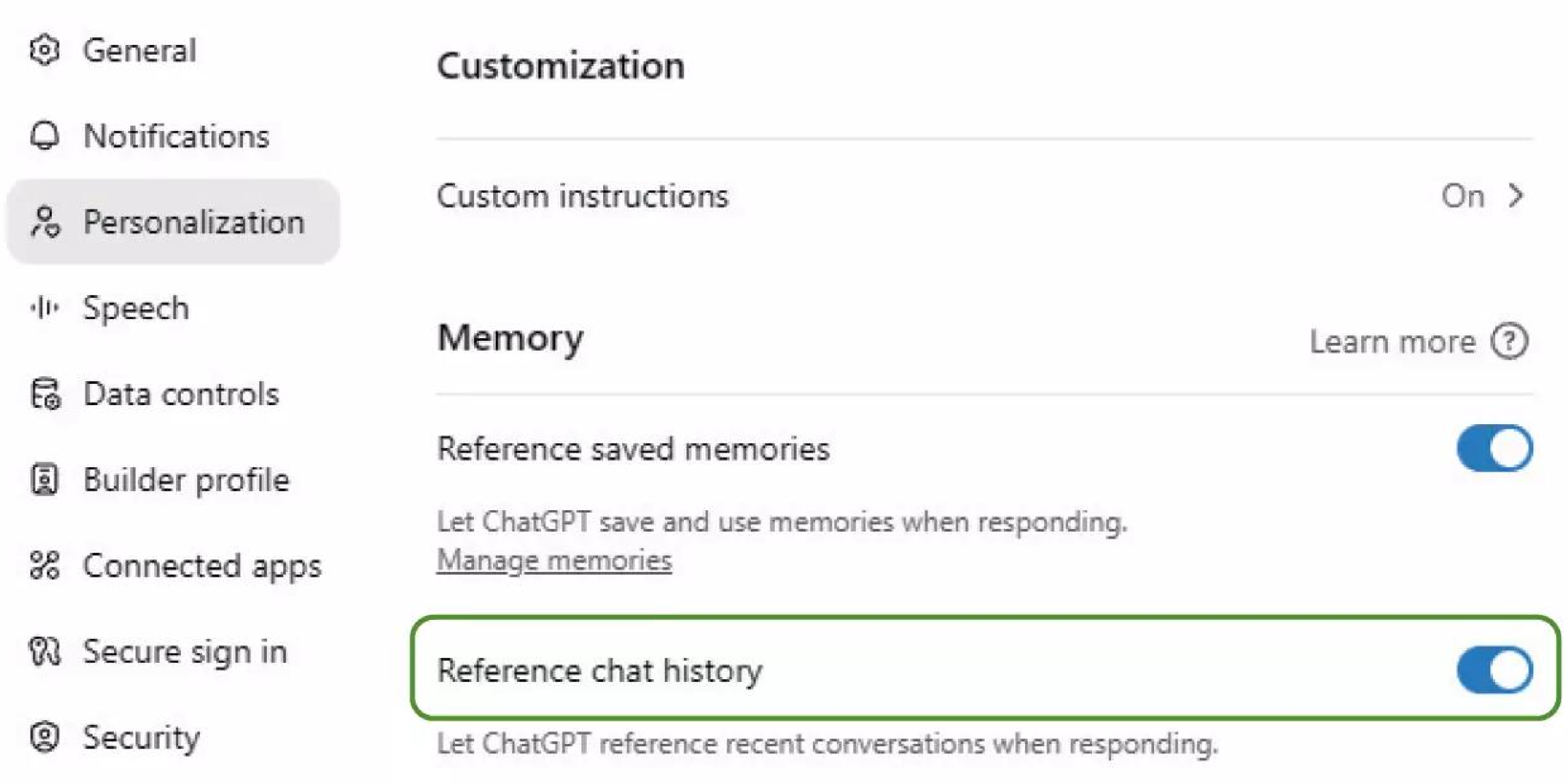
In our AI experiences in the past, we predicted that when Anthropic added web-search capabilities to the free version of Claude (**www.claude.ai**), the AI assistant would produce higher-quality responses. That's now come to pass and all Claude users have access to web search through its new Sonnet 4 language model.

Like ChatGPT, Claude automatically searches the web when it determines a query would "benefit from up-to-date information or specialised knowledge". This means you can ask it about current events, get the weather forecast and search for topics not covered in Claude's training data.

Claude displays a 'Searching the web' message (see screenshot above) when using this mode, and cites the sources of the details it provides.

ChatGPT

Store chat details for future reference



Customization

Custom instructions — On

Memory — Learn more

Reference saved memories ●

Let ChatGPT save and use memories when responding.
Manage memories

Reference chat history ●

Let ChatGPT reference recent conversations when responding.

OpenAI has upgraded the Memory feature in ChatGPT to remember details of your recent chats. Previously, you could use Memory to improve the relevance of ChatGPT's responses by asking it to store specific details of your interests and tastes, for example 'Remember I use Windows 11 not Window 10'.

The updated Memory feature automatically saves and refers to details of your previous chats, so you don't need to start from scratch when you begin a new conversation. As this may encroach on your privacy, the option is disabled by default. However, it's worth turning on to get more focused responses from ChatGPT, without needing to explain yourself every time.

To do so, click your profile icon in the top-right corner of the ChatGPT website and choose Settings, then Personalisation. Switch on Memory (if it isn't on already) and enable the option 'Reference chat history' (see screenshot above).

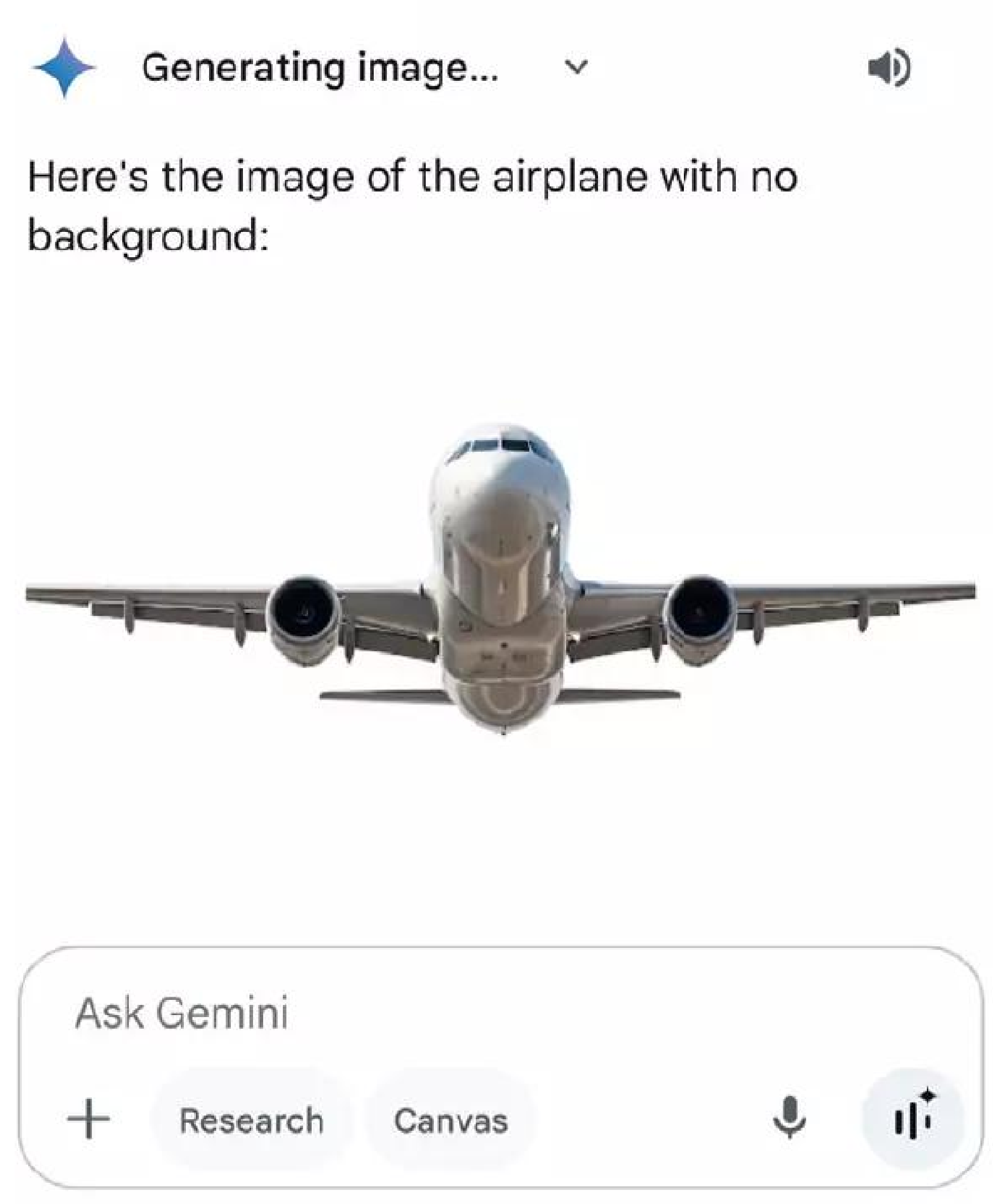
GEMINI

Edit images using text prompts

As well as generating images from your text prompts, Google Gemini can now edit them too. This means you can modify pictures you create in or upload to the Gemini website or mobile app, then download the result.

Examples include removing the background from an image (see screenshot below left), adding or deleting elements, adjusting the colours and applying different themes. Because – unlike most chatbots – Gemini doesn't specify a daily limit on image generation, you can keep trying edits until you perfect the picture.

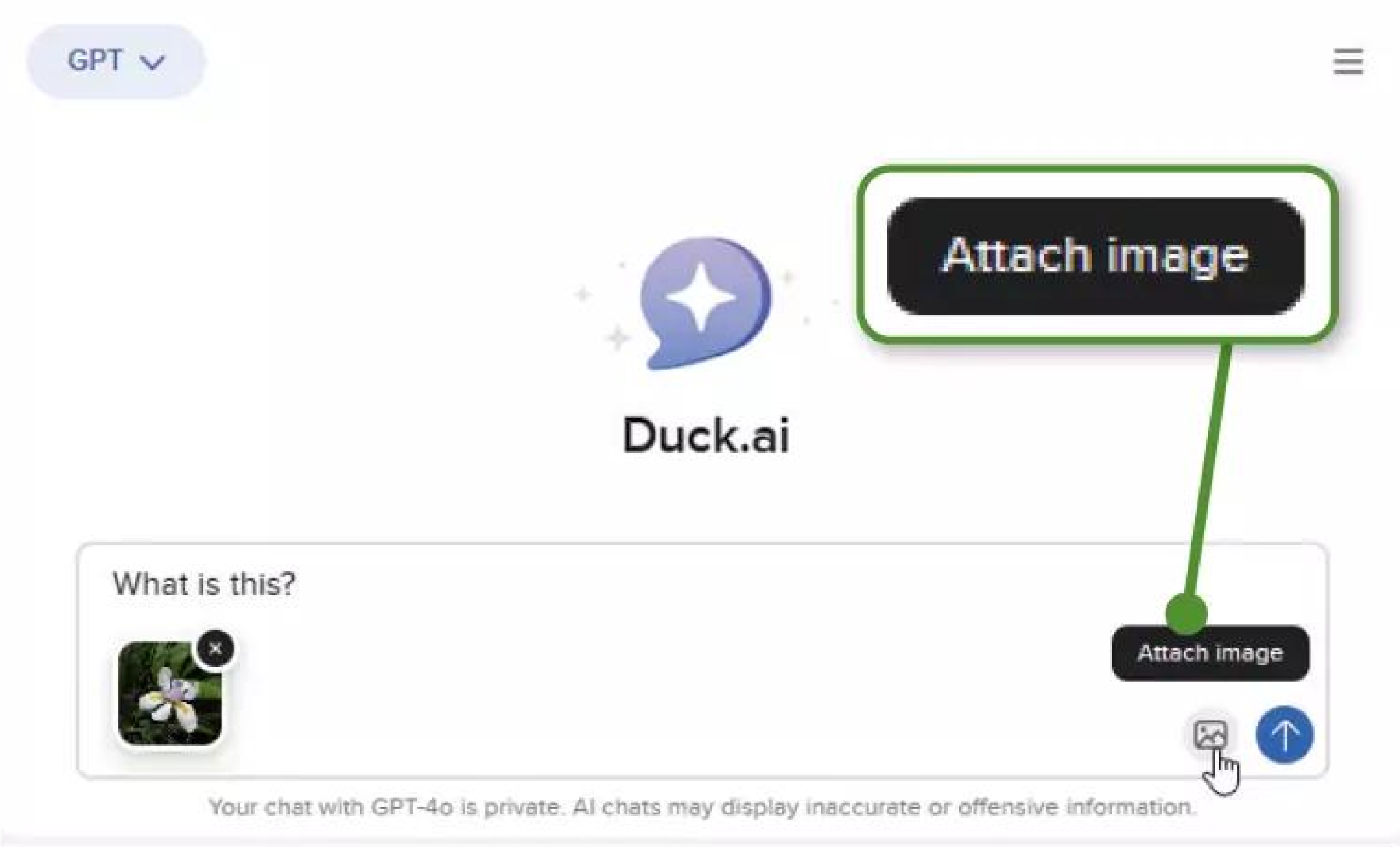
The editing feature is available to all Gemini users with personal accounts (including free ones), but not yet to Google Workspace accounts.



Here's the image of the airplane with no background:

DUCK.AI

Upload images for analysis



What is this?

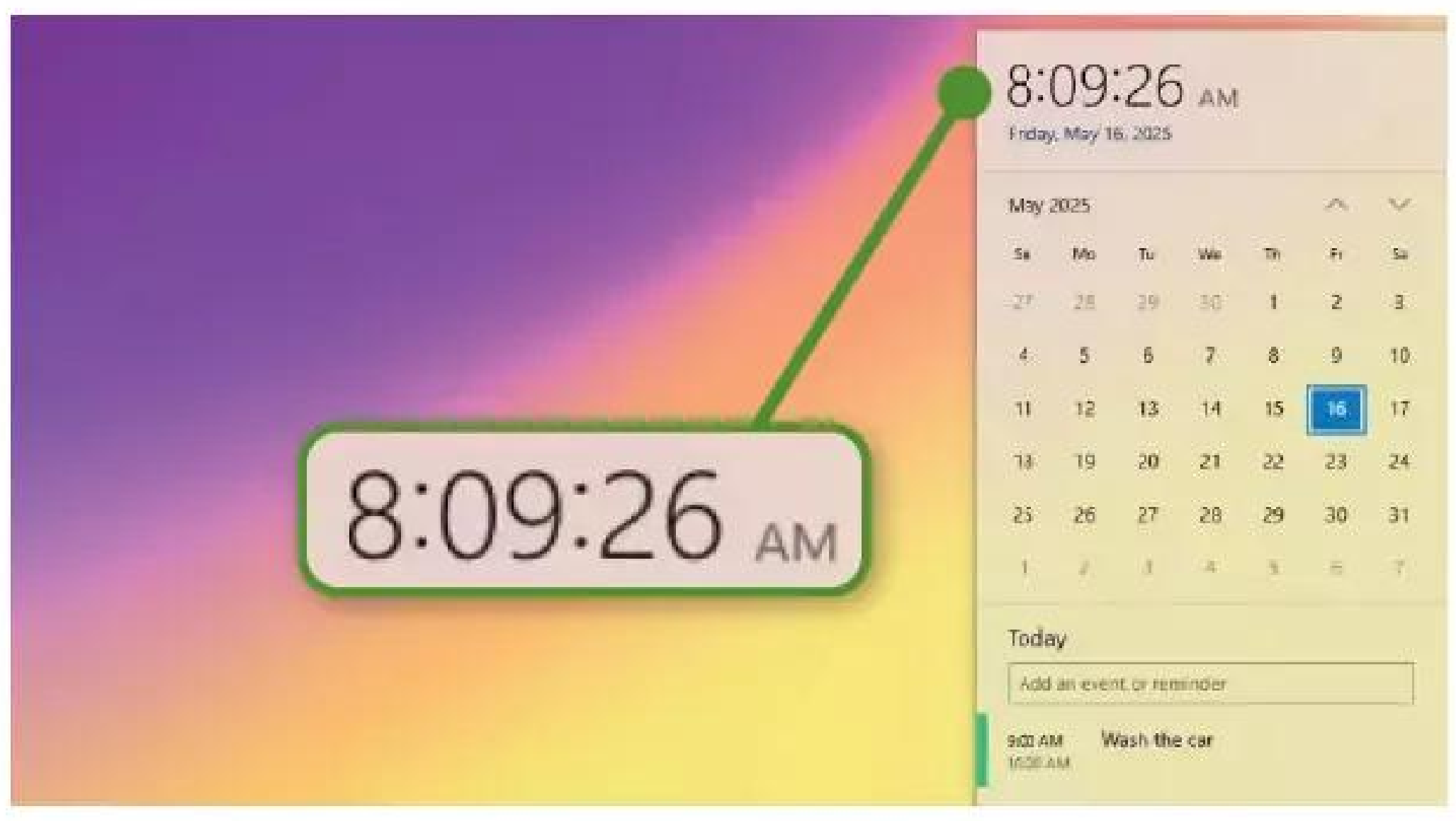
Your chat with GPT-4o is private. AI chats may display inaccurate or offensive information.

DuckDuckGo has added an image-upload feature to its AI service Duck.ai (**www.duck.ai**), which lets you chat anonymously to popular large-learning models (LLMs). This means you can now ask it to analyse images and identify their subjects.

The new option is only available when using the default GPT-4o Mini model in Duck.ai. To upload a picture, either click the 'Attach image' icon in Duck.ai's message box (see screenshot above), or drag the image to the box from a folder on your computer. Enter a query such as 'What is this?' and click the Send button to submit it for analysis. ■

Make Windows better

Expert tips for a better experience.


8:09:26 AM
8:09:26 AM
Friday, May 16, 2025
May 2025
Today
Add an event or reminder
Wash the car

WINDOWS 10

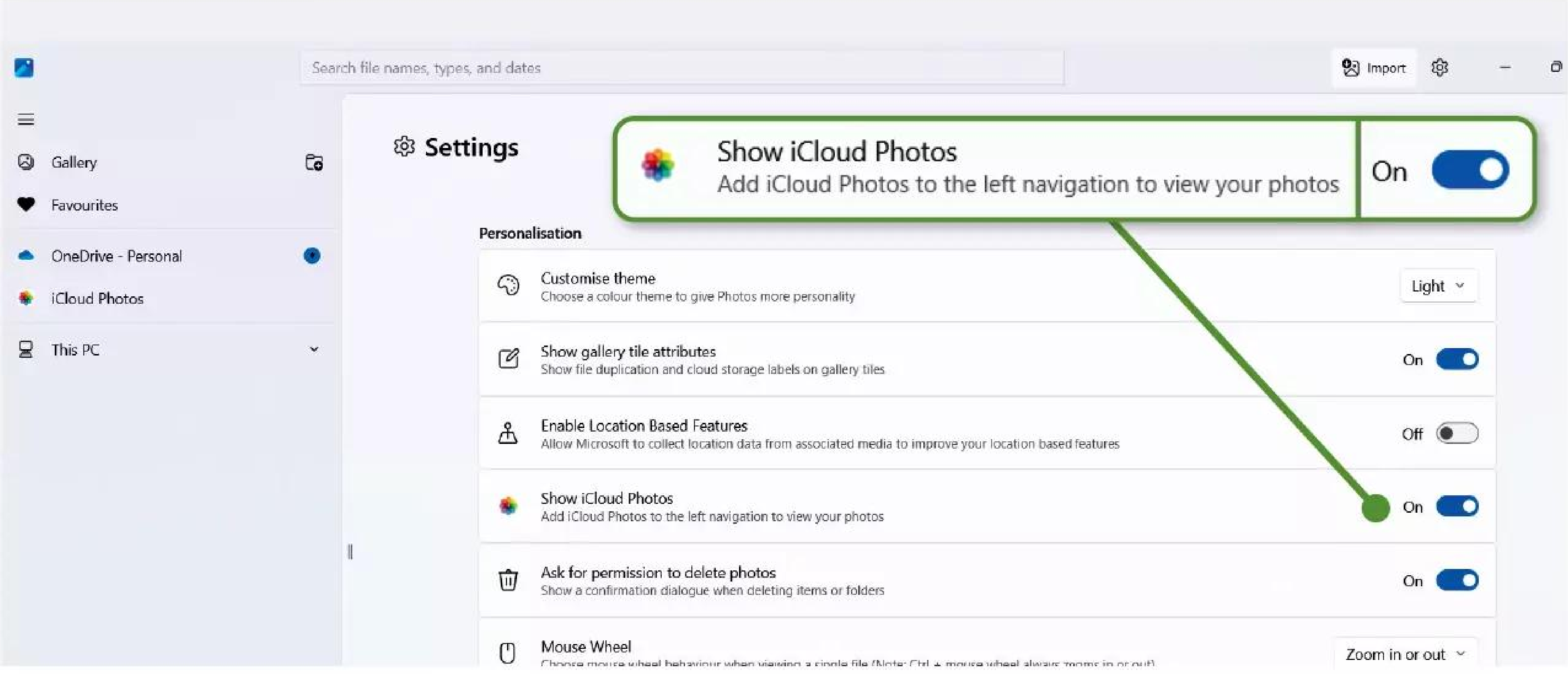
Bring back the time in the Calendar box

With the update KB5053643, released in April, Microsoft removed the time from the top of the Calendar box that appears when you click the bottom right of the Windows 10 taskbar. Microsoft made the change to reduce strain on the processor, but it still annoyed many users, who called for its return. It seems that Microsoft took notice because it has reinstated the time in the recent update KB5058481 (as shown in the screenshot below). It's available to Windows Insiders now and should be coming to all users soon (see **tinyurl.com/APC550time**).

WINDOWS 10 & 11

See photos taken on your iPhone and iPad on your PC

You can easily view photos taken on your iPhone and iPad on your Windows 11 PC, saving you the hassle of emailing them to yourself. Install Apple's 'iCloud for Windows' app (**support.apple.com/en-au/103232**), then sign in with your Apple ID and turn on photo syncing. Next, in Windows 11, open the Photos app in Windows and click the Settings cog top right. Now make sure the 'Show iCloud Photos' slider is turned on (see screenshot below) then click 'iCloud Photos' on the left. In Windows 10, look for the 'iCloud Photos' under Pictures in File Explorer.


Search file names, types, and dates
Import
Gallery
Favourites
OneDrive - Personal
iCloud Photos
This PC
Settings

Show iCloud Photos
Add iCloud Photos to the left navigation to view your photos — On

Personalisation

Customise theme
Choose a colour theme to give Photos more personality — Light

Show gallery tile attributes
Show file duplication and cloud storage labels on gallery tiles — On

Enable Location Based Features
Allow Microsoft to collect location data from associated media to improve your location based features — Off

Show iCloud Photos
Add iCloud Photos to the left navigation to view your photos — On

Ask for permission to delete photos
Show a confirmation dialogue when deleting items or folders — On

Mouse Wheel — Zoom in or out

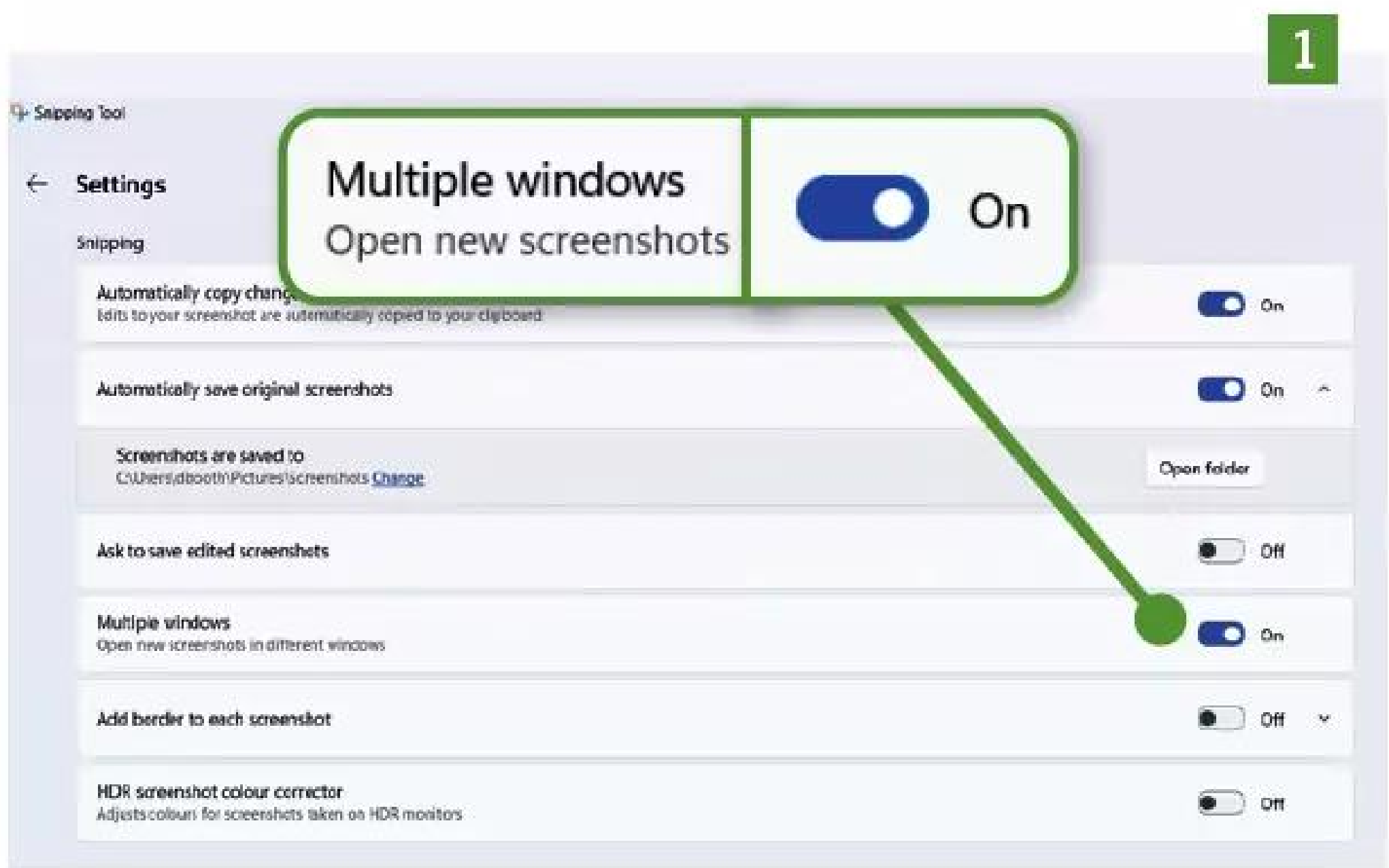
Windows 11

Compare screenshots side by side

Snipping Tool has a useful setting that saves screenshots in separate windows, making it easy for you to compare them side by side. The setting is turned off by default, so first search for and then open Snipping Tool, then click the three dots top right followed by Settings. Now turn on the 'Multiple windows' slider (see screenshot 1).

Next, take a screenshot and open it in Snipping Tool. Press Ctrl+N and take another screenshot and you'll be able to open it alongside your existing one 2. Keep doing this until you've got all the screenshots you need.

1


Snipping Tool
Settings
Snipping

Multiple windows
Open new screenshots — On

Automatically copy changes
Edits to your screenshot are automatically copied to your clipboard — On

Automatically save original screenshots — On

Screenshots are saved to
C:\Users\dbooth\Pictures\Screenshots Change — Open folder

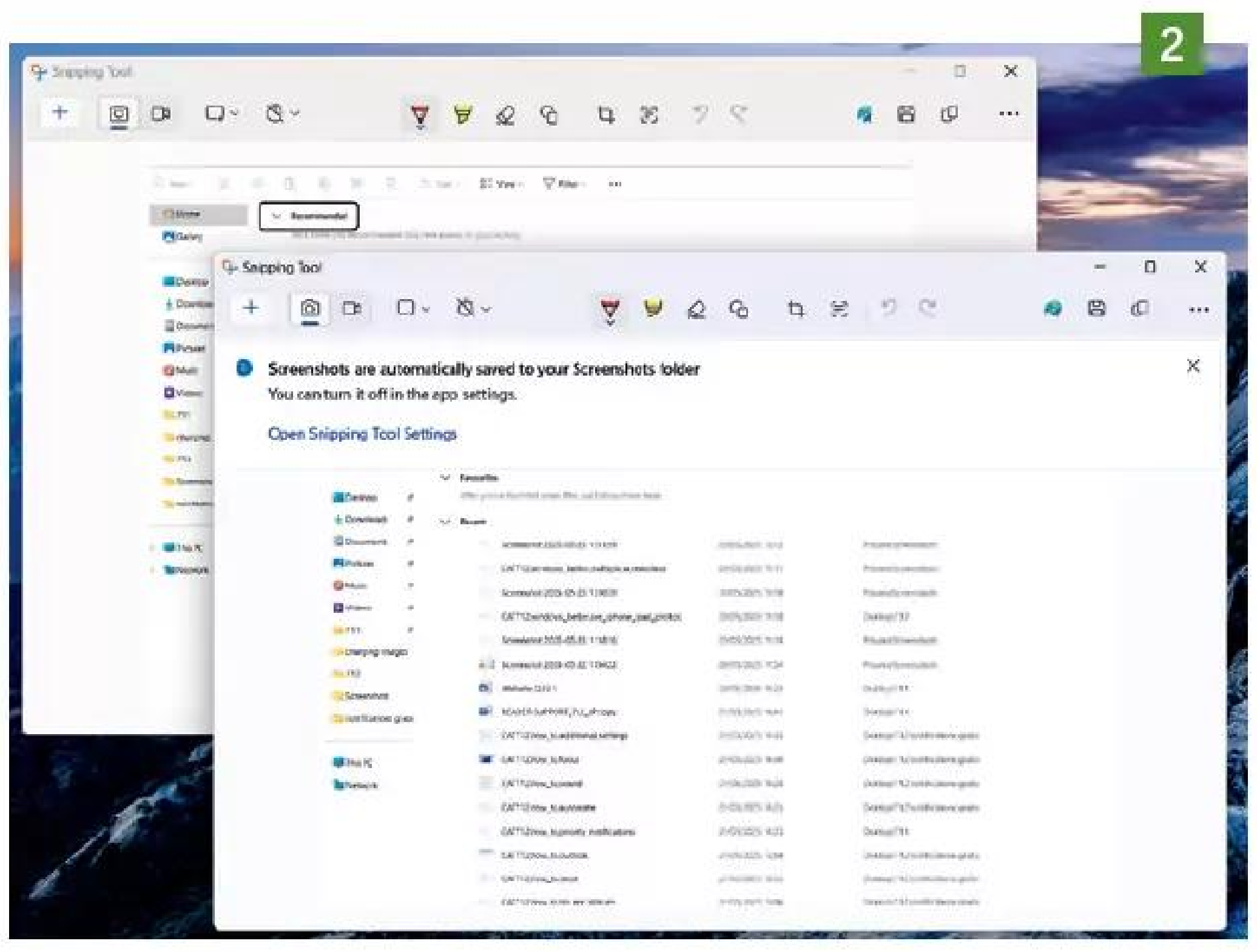
Ask to save edited screenshots — Off

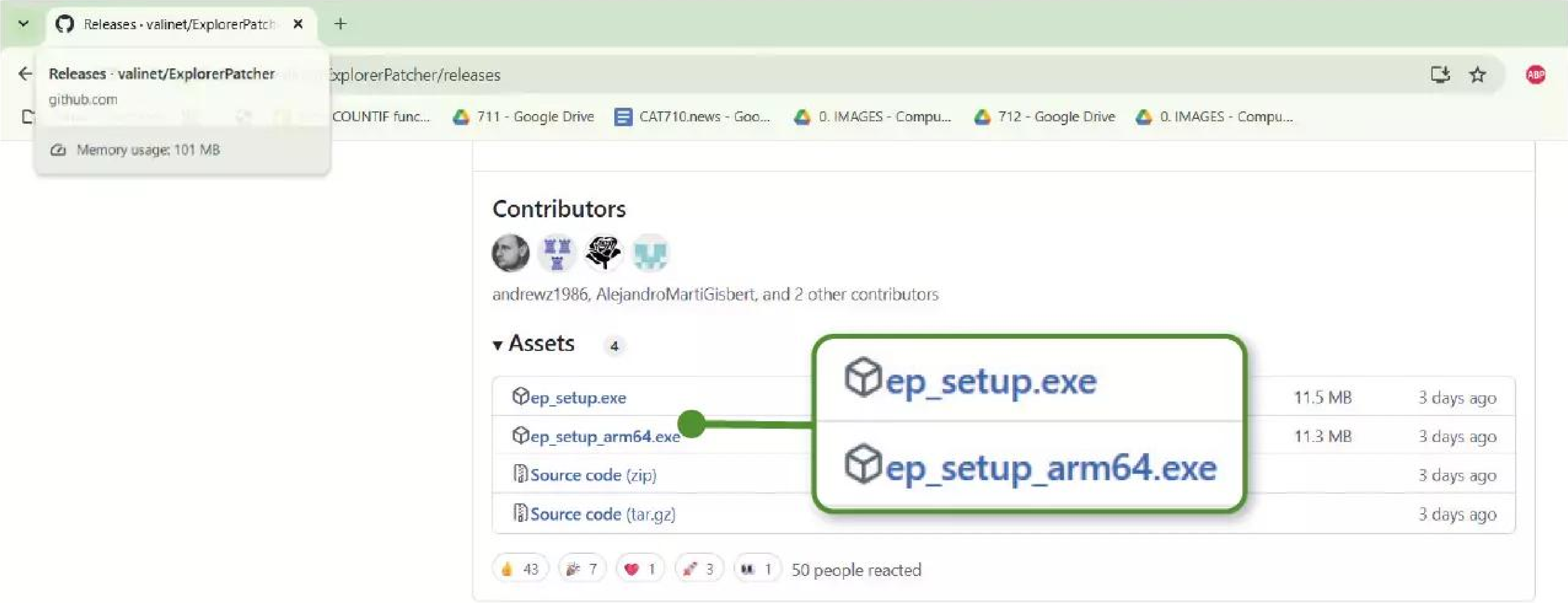
Multiple windows
Open new screenshots in different windows — On

Add border to each screenshot — Off

HDR screenshot colour corrector
Adjusts colours for screenshots taken on HDR monitors — Off

2


Snipping Tool
Screenshots are automatically saved to your Screenshots folder
You can turn it off in the app settings.
Open Snipping Tool Settings


Releases · valinet/ExplorerPatcher
github.com
Memory usage: 101 MB
ExplorerPatcher/releases
COUNTIF func...
711 - Google Drive
CAT710.news - Goo...
0. IMAGES - Compu...
712 - Google Drive
0. IMAGES - Compu...

Contributors

andrewz1986, AlejandroMartiGisbert, and 2 other contributors

Assets 4

ep_setup.exe	11.5 MB	3 days ago
ep_setup_arm64.exe	11.3 MB	3 days ago
Source code (zip)		3 days ago
Source code (tar.gz)		3 days ago

43 7 1 3 1 50 people reacted

WINDOWS 11

Unblock Windows-tweaking software

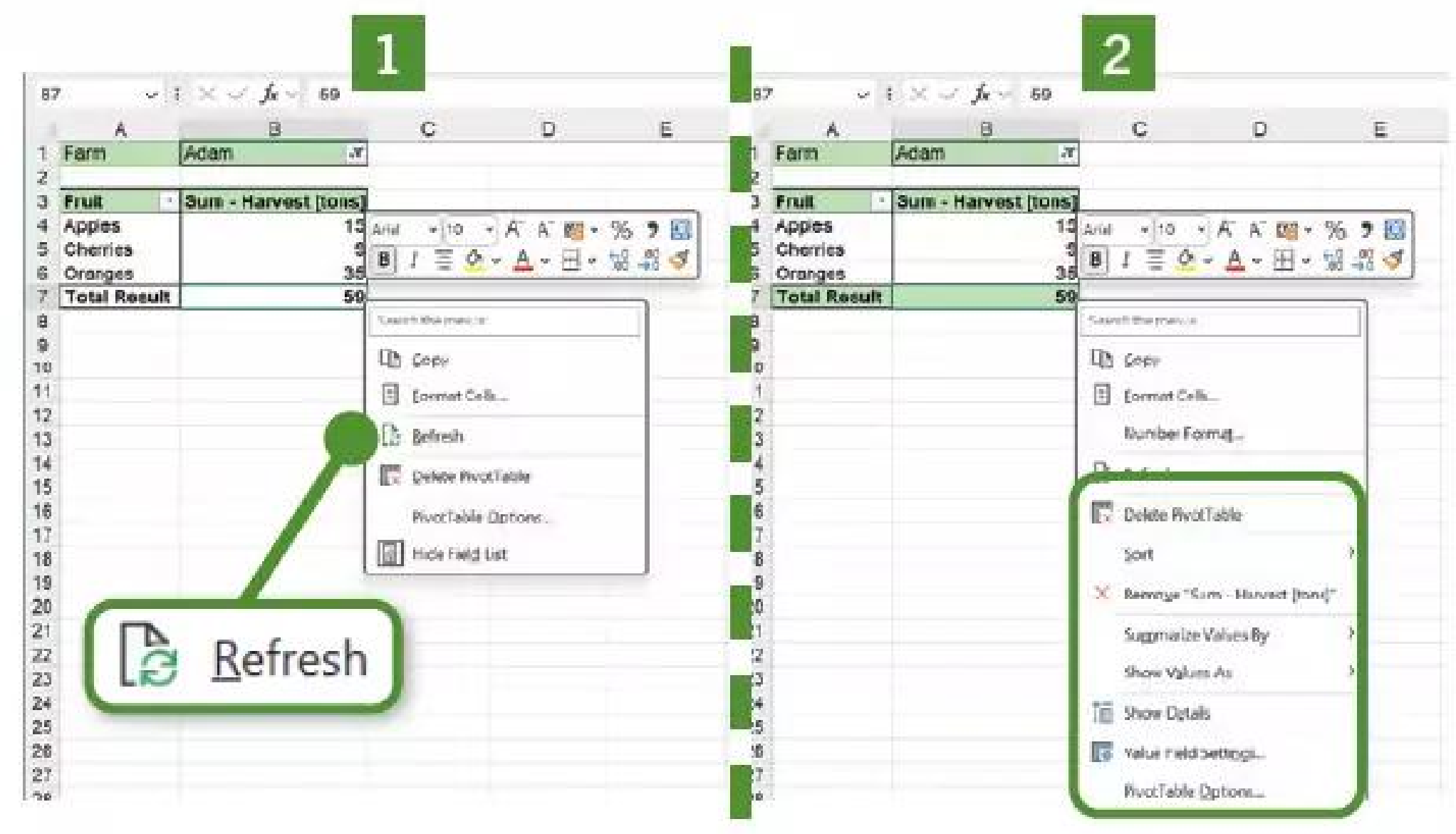
Last year, Microsoft Defender started to block some unofficial tools that let you change how Windows works. It said this was for security reasons, but it was an unnecessarily cautious approach that prevented users from tweaking elements like the Start menu, taskbar and File Explorer.

One of the best tools it blocked was ExplorerPatcher, which lets you make several useful hacks such as resizing icons, moving the taskbar and adding items to the right-click menu. Its developers have released a new version (22631.5335.68.2) that it says beats Microsoft's blocks, letting you install and use it in Windows 11 24H2.

Download it from its GitHub page by visiting **github.com/valinet/ExplorerPatcher/releases** then scrolling down to and clicking the Assets heading, followed by the 'ep_setup.exe' link or 'ep_setup_arm64.exe' (see screenshot above) if your computer has an ARM processor. ■

Make Office better

Expert tips for a better experience.



LIBREOFFICE CALC

Open pivot tables exported to Microsoft Excel

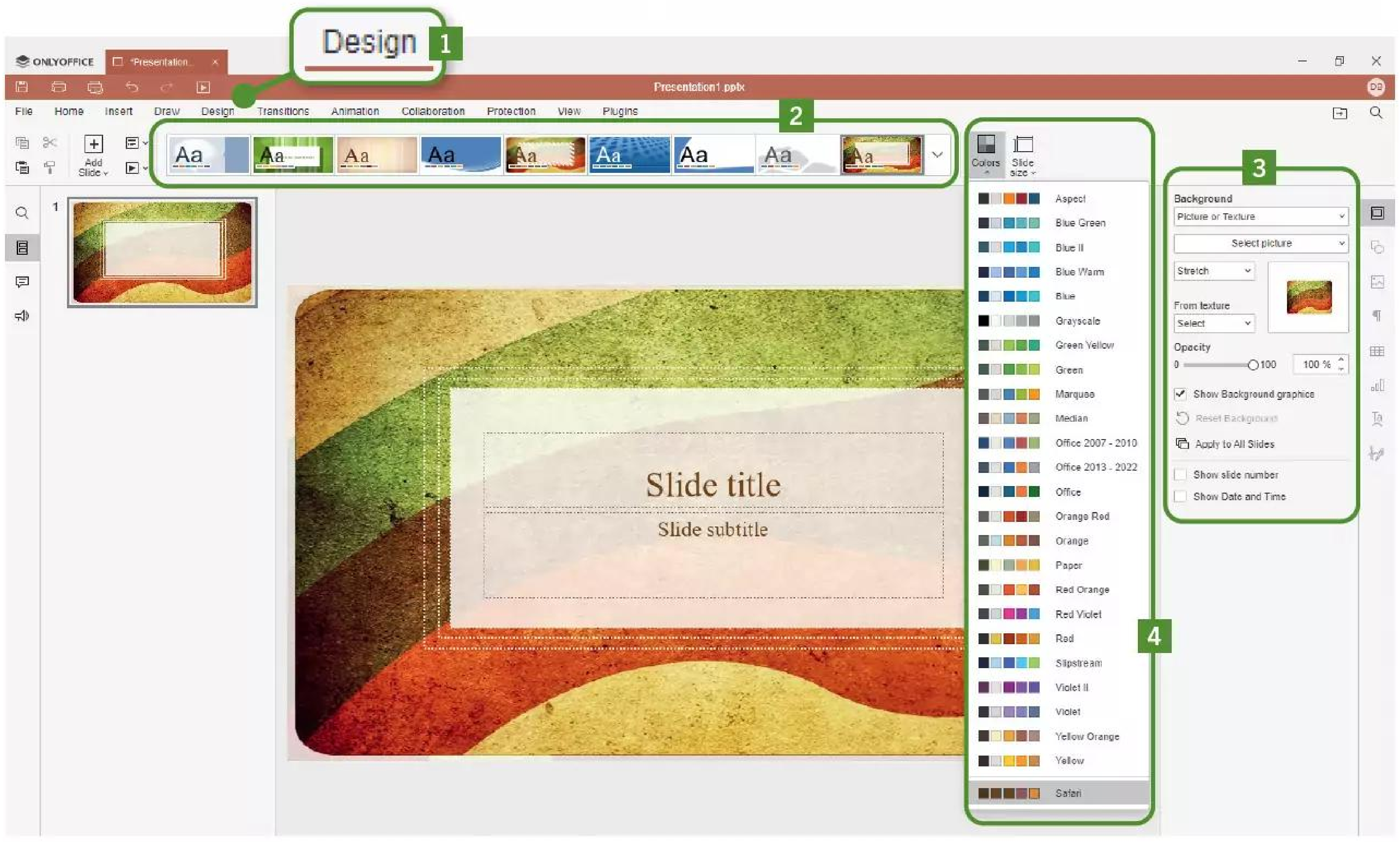
Pivot tables in spreadsheets quickly summarise and analyse your data. Unlike a standard 'static' table, you can rearrange rows and columns to spot patterns and calculate totals without changing any of the original data.

They're extremely useful, so we're pleased that LibreOffice has updated Calc so you can fully export them to Microsoft Excel. Previously, when you saved a Calc spreadsheet as an Excel (XLSX) file, pivot tables lost all their data when you reopened the file in Excel. This meant you had to right-click them and select Refresh (see screenshot 1 above) to bring back the data. LibreOffice fixed this in the update 25.2.3, which arrived at the end of April. It means when you now open pivot tables in Excel you'll see all the actions you could normally perform without having to refresh them 2.

ONLYOFFICE

See presentation templates in new Design tab

Version 8.3 of OnlyOffice, released in February, added a new Design tab to the Presentation tool (1 in our screenshot below). Click it and you'll see all the templates available for your slides 2, and options on the right for changing elements such as opacity, gradient and texture 3. There's also a dropdown menu to change the colours on your slides 4.


Design
1
2
3
4
ONLYOFFICE
Presentation1.pptx
File
Home
Insert
Draw
Design
Transitions
Animation
Collaboration
Protection
View
Plugins
Slide title
Slide subtitle
Background
Picture or Texture
Select picture
Stretch
Opacity
Show Background graphics
Apply to All Slides
Show slide number
Show Date and Time
Aspect
Blue Green
Blue II
Blue Warm
Blue
Grayscale
Green Yellow
Green
Marquee
Median
Office 2007 - 2010
Office 2013 - 2022
Office
Orange Red
Orange
Paper
Red Orange
Red Violet
Red
Slipstream
Violet II
Violet
Yellow Orange
Yellow
Satin

MICROSOFT WORD

Go to last edit in a document

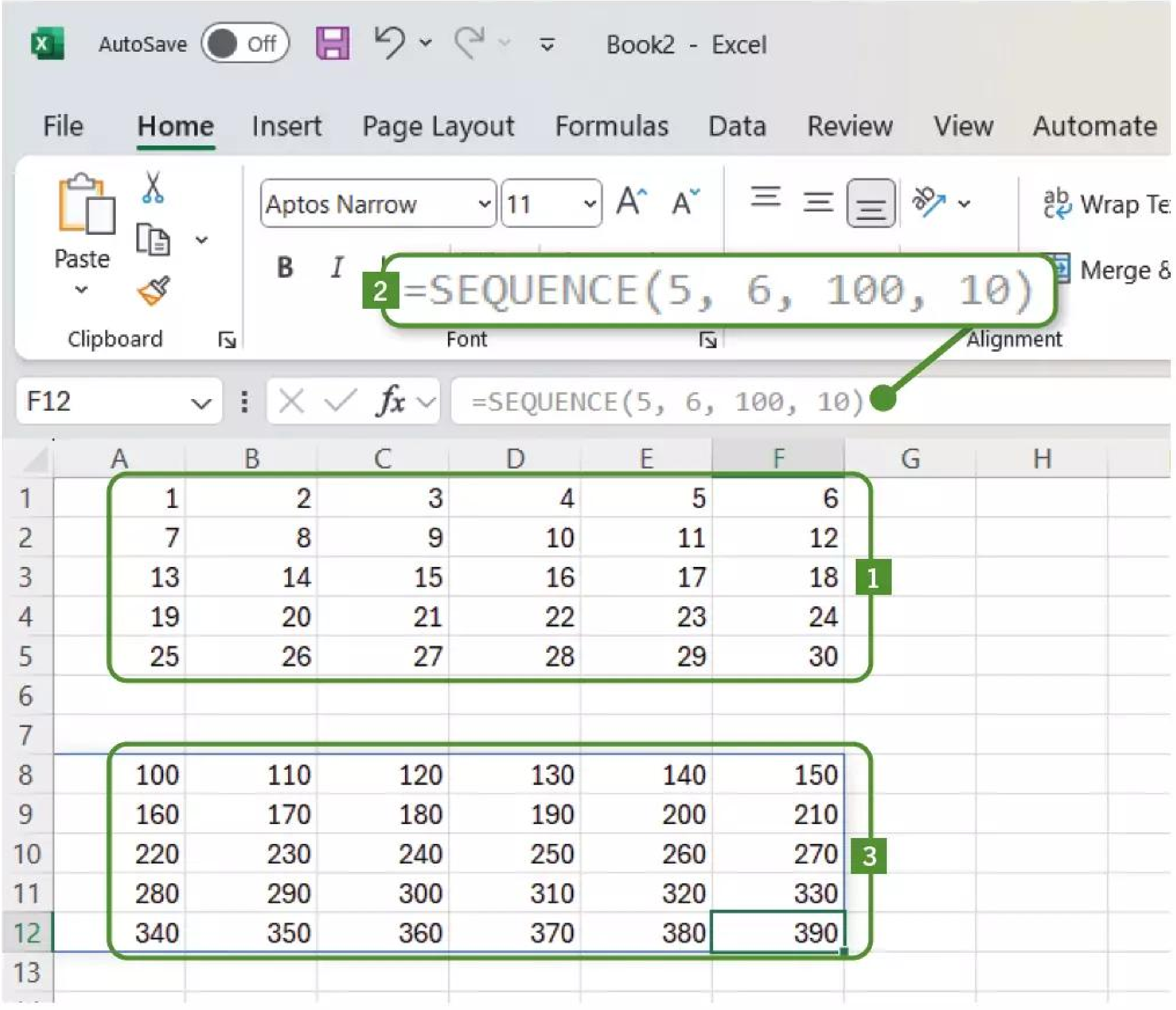
When editing in Word, you can press Shift+F5 to go back to your last edit, no matter where it was in your document. In fact, you can press it up to three times to go back to your most recent three edits, saving you the hassle of long scrolling. Note that on some laptops you'll need to also hold down the Fn button to activate the tasks performed by the F1 to F12 buttons. Pressing F5 by itself in Word brings up the 'Find and Replace' box. In LibreOffice Writer the Shift+F5 shortcut moves the cursor to the position it had when you last saved the document. The shortcut doesn't do anything in OnlyOffice. ■

Microsoft Excel

Create number sequences in spreadsheets

In Excel 2021 (and Microsoft 365), Microsoft added the =SEQUENCE function to let you easily generate a list of sequential numbers in an array of cells. For example, typing =SEQUENCE(10) fills the numbers 1 to 10 vertically in a single column, while =SEQUENCE(1,10) fills them across 10 columns horizontally.

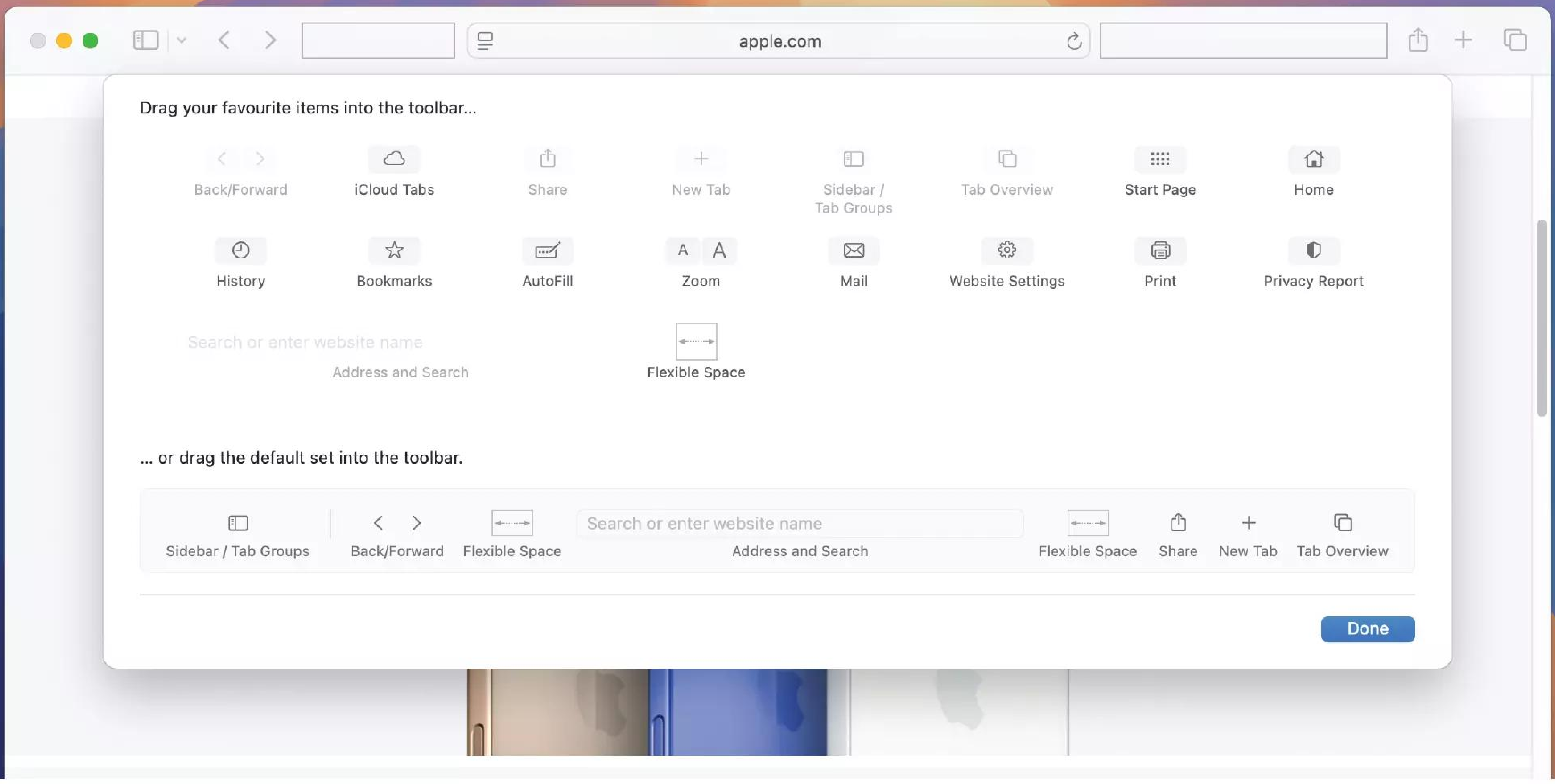
We've typed =SEQUENCE(5,6) , which fills numbers row by row, down five rows and across six columns (1 in our screenshot). The first number before the comma sets the number of rows, and the second sets the columns. You can also use it to start at a specific number and pick a different sequence. For example, =SEQUENCE(5,6,100,10) 2 keeps the same five-row/six-column structure, but starts the sequence at 100 and jumps 10 each time 3.


AutoSave
Off
Book2 - Excel
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Automate
Paste
Clipboard
Aptos Narrow
11
Font
Wrap Te
Merge &
Alignment
F12
1
2
3

2 =SEQUENCE(5, 6, 100, 10)

F12: =SEQUENCE(5, 6, 100, 10)

	A	B	C	D	E	F	G	H
1	1	2	3	4	5	6		
2	7	8	9	10	11	12		
3	13	14	15	16	17	18		
4	19	20	21	22	23	24		
5	25	26	27	28	29	30		
6								
7								
8	100	110	120	130	140	150		
9	160	170	180	190	200	210		
10	220	230	240	250	260	270		
11	280	290	300	310	320	330		
12	340	350	360	370	380	390		
13								


apple.com
Back/Forward
iCloud Tabs
Share
New Tab
Sidebar / Tab Groups
Tab Overview
Start Page
Home
History
Bookmarks
AutoFill
Zoom
Mail
Website Settings
Print
Privacy Report
Search or enter website name
Address and Search
Flexible Space
Sidebar / Tab Groups
Back/Forward
Flexible Space
Search or enter website name
Address and Search
Flexible Space
Share
New Tab
Tab Overview
Done

Drag your favourite items into the toolbar...

... or drag the default set into the toolbar.

Customise toolbars in macOS

Ensure that the features you use most frequently are just a click away

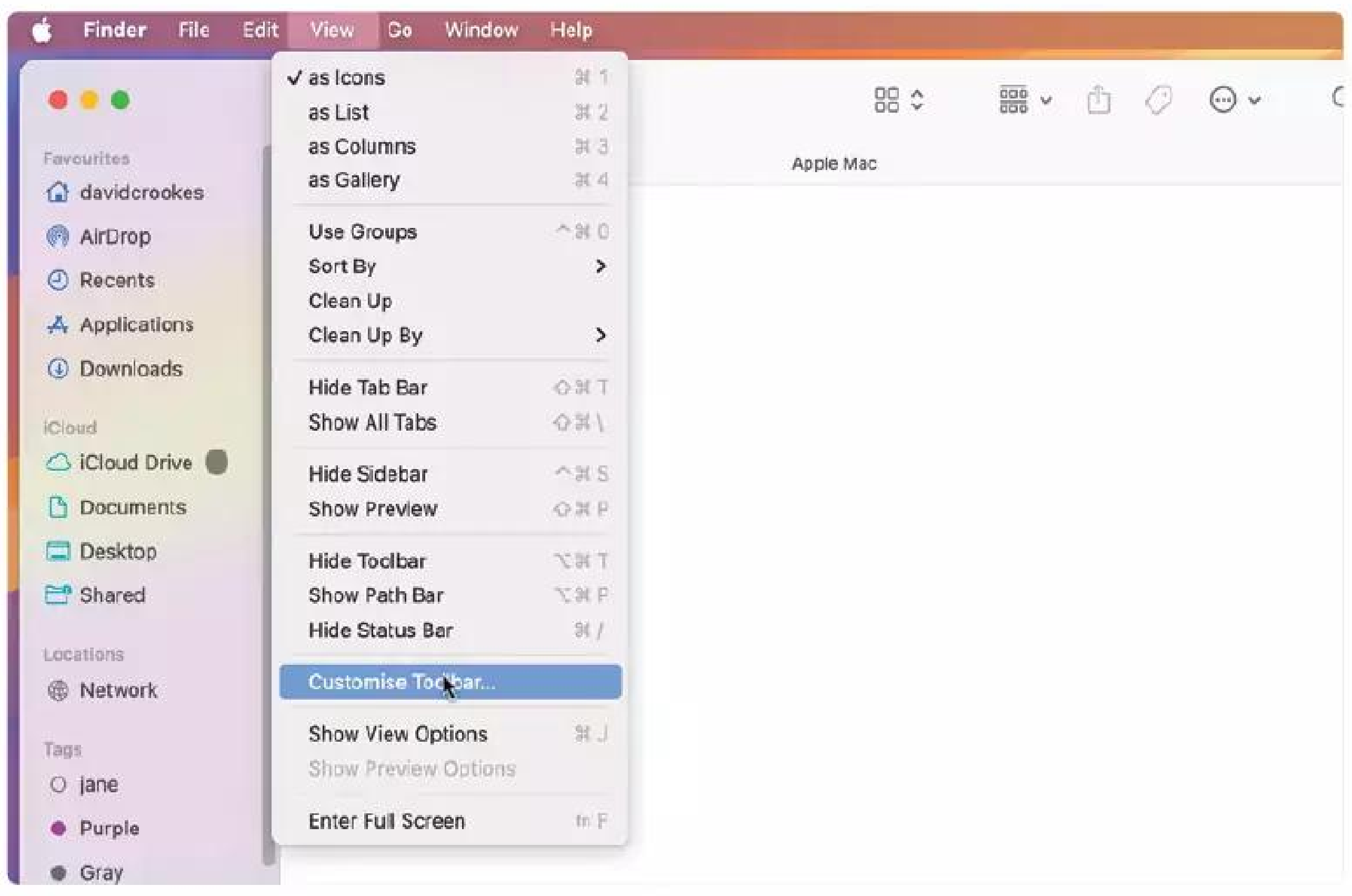
IT WILL TAKE
10 minutes
YOU WILL LEARN
How to make the toolbar in Finder – and many macOS apps – work better for you
YOU'LL NEED
macOS 10.14 or later

The toolbars in Finder and many of the apps built into macOS, offer plenty of useful options, but they also have a good number you may never use and some stark omissions. Wouldn't it be great if you could select items in Finder and click a Delete button to remove them or select AirDrop to share? You may even desire a button to burn files and folders to a CD or DVD. Well, all these functions are actually available if you just know where to look...

The toolbars of many built-in Mac apps are customisable – in Finder alone, you can add 11 items, including a New Folder function and Quick Look. Those controls can be included in addition to – or as a replacement for – the default set of toolbar items, but you don't need to stop there. In Finder, we'd also suggest selecting View > Show Path to display the current file path, and View > Show Status Bar to show a summary of the number of files and folders you can see. Let's discover more...

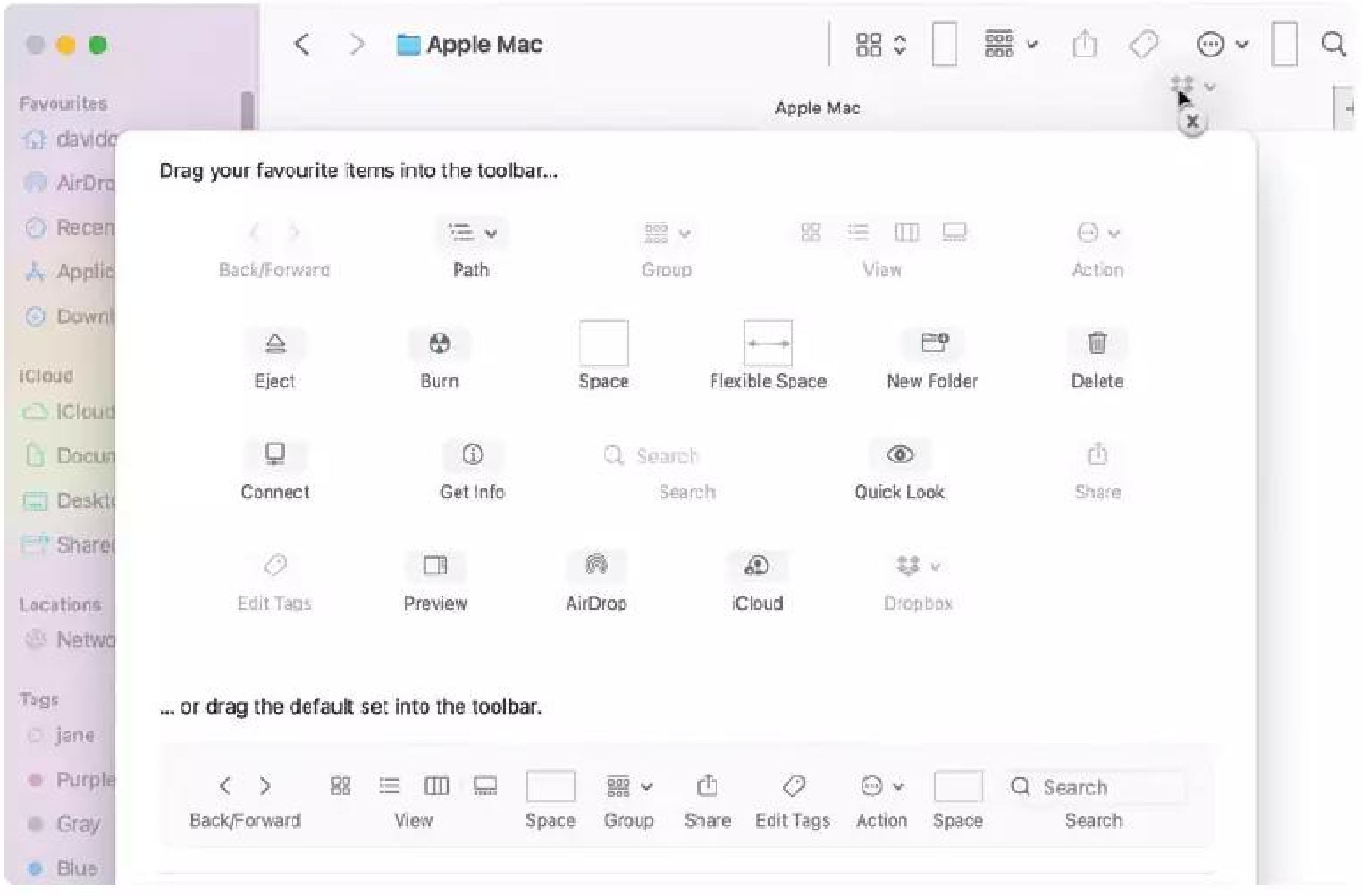
David Crookes ■

How to Add and remove items


Finder
File
Edit
View
Go
Window
Help
Favourites
davidcrookes
AirDrop
Recents
Applications
Downloads
iCloud
iCloud Drive
Documents
Desktop
Shared
Locations
Network
Tags
jane
Purple
Gray
✓ as Icons
as List
as Columns
as Gallery
Use Groups
Sort By
Clean Up
Clean Up By
Hide Tab Bar
Show All Tabs
Hide Sidebar
Show Preview
Hide Toolbar
Show Path Bar
Hide Status Bar
Customise Toolbar...
Show View Options
Show Preview Options
Enter Full Screen
Apple Mac

1 Manage the tools

You can control which options appear in the toolbars for Finder and many built-in apps. Click View in the menu bar and look for Customise Toolbar. Alternatively, Ctrl-click the toolbar and select Customise Toolbar.


Apple Mac
Back/Forward
Path
Group
View
Action
Eject
Burn
Space
Flexible Space
New Folder
Delete
Connect
Get Info
Search
Quick Look
Share
Edit Tags
Preview
AirDrop
iCloud
Dropbox
Back/Forward
View
Space
Group
Share
Edit Tags
Action
Space
Search

Drag your favourite items into the toolbar...

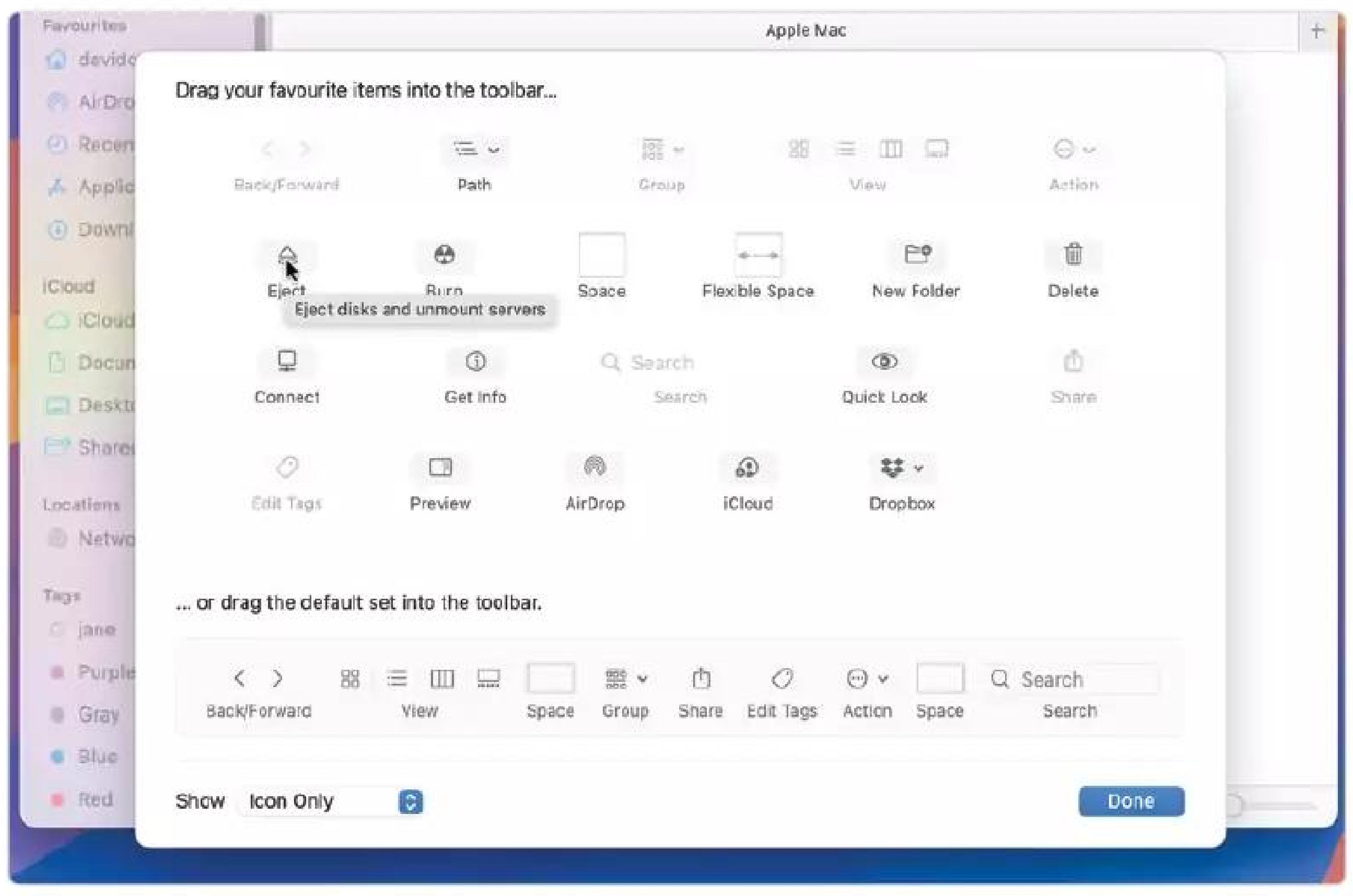
... or drag the default set into the toolbar.

2 Make some room

An app's toolbar may contain some infrequently used items so you may decide to clear some space by removing these first. This is as easy as clicking an item and dragging it from the toolbar into the pop-up window.

GENIUS TIP!
You don't have to click Tools > Customise Toolbar to remove an item from the toolbar. You can press and hold Cmd and drag the item away.

Continued… Add and remove items



Drag your favourite items into the toolbar…

Eject disks and unmount servers

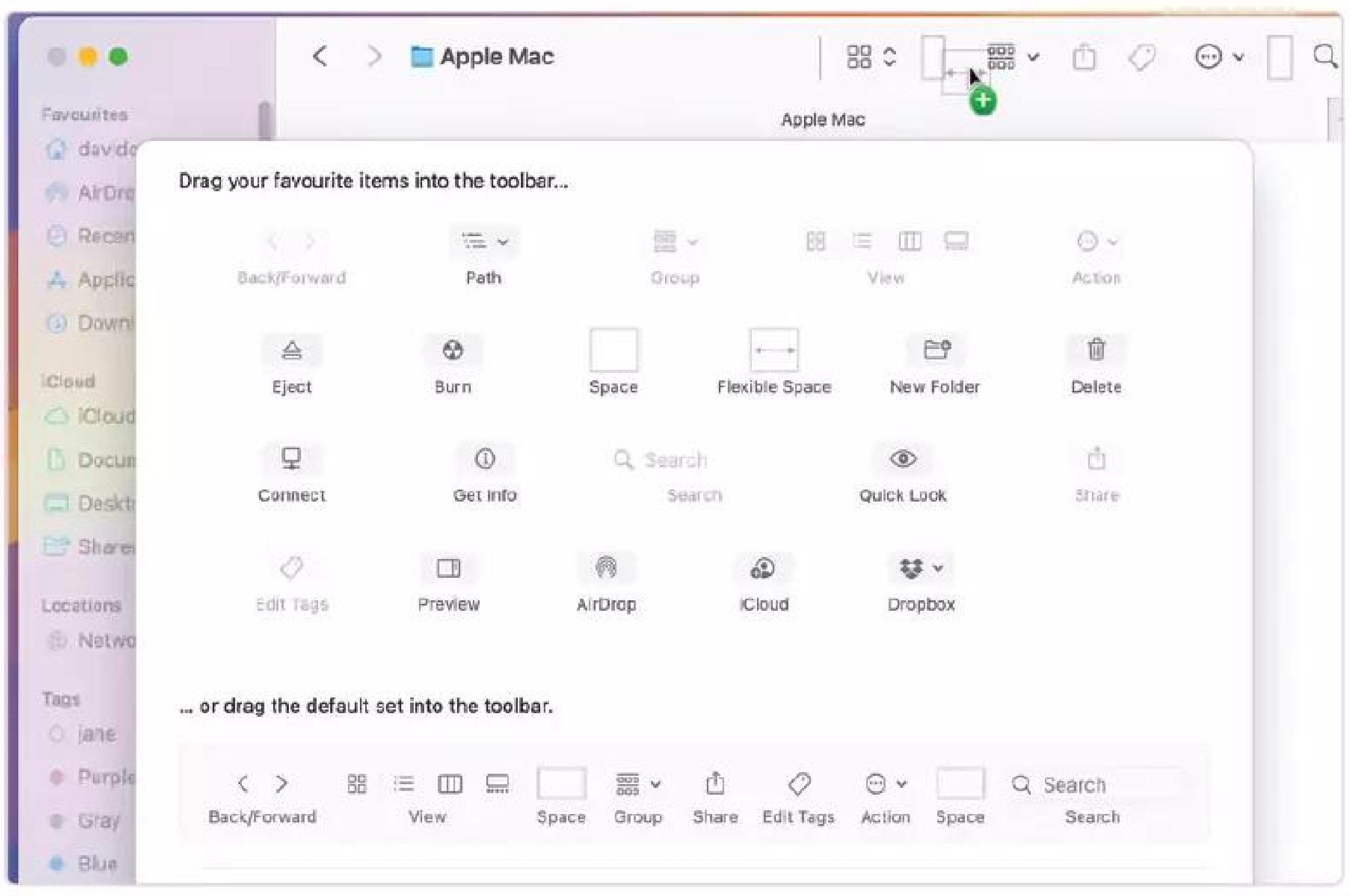
… or drag the default set into the toolbar.

Show Icon Only

Apple Mac
Back/Forward
Path
Group
View
Action
Eject
Burn
Space
Flexible Space
New Folder
Delete
Connect
Get Info
Search
Quick Look
Share
Edit Tags
Preview
AirDrop
iCloud
Dropbox
Done

3 Add toolbar items

Now start building and customising. The items at your disposal will vary from app to app but identify those you're most likely to use, then click and drag them to the app's toolbar before dropping them into place.



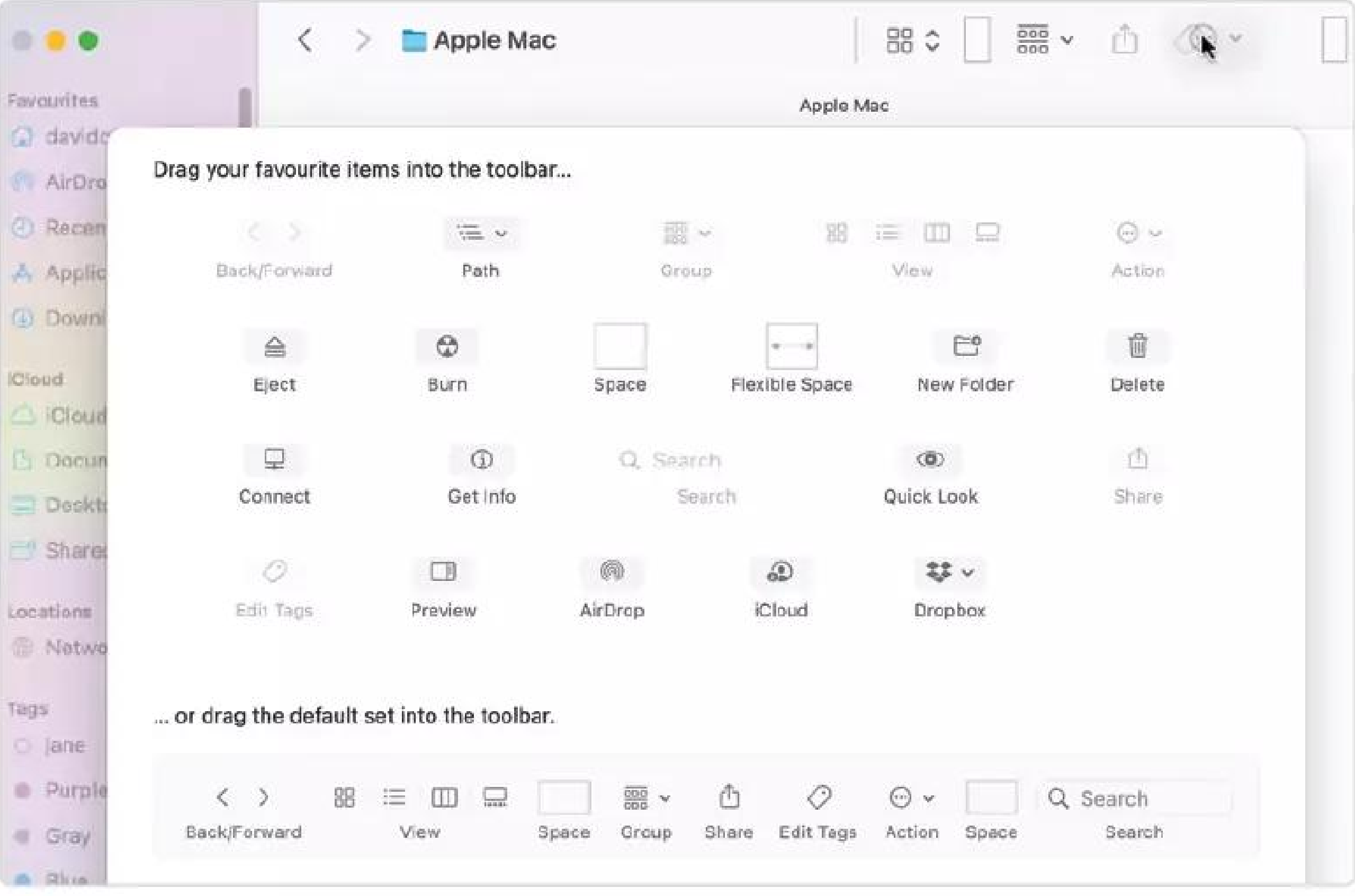
Drag your favourite items into the toolbar…

… or drag the default set into the toolbar.

Apple Mac
Back/Forward
Path
Group
View
Action
Eject
Burn
Space
Flexible Space
New Folder
Delete
Connect
Get Info
Search
Quick Look
Share
Edit Tags
Preview
AirDrop
iCloud
Dropbox

4 Include flexible spaces

If you pack your toolbar with items, they may become difficult to find. It's a good idea to group related functions and separate them with flexible spaces. These will expand or contract to match the window width.



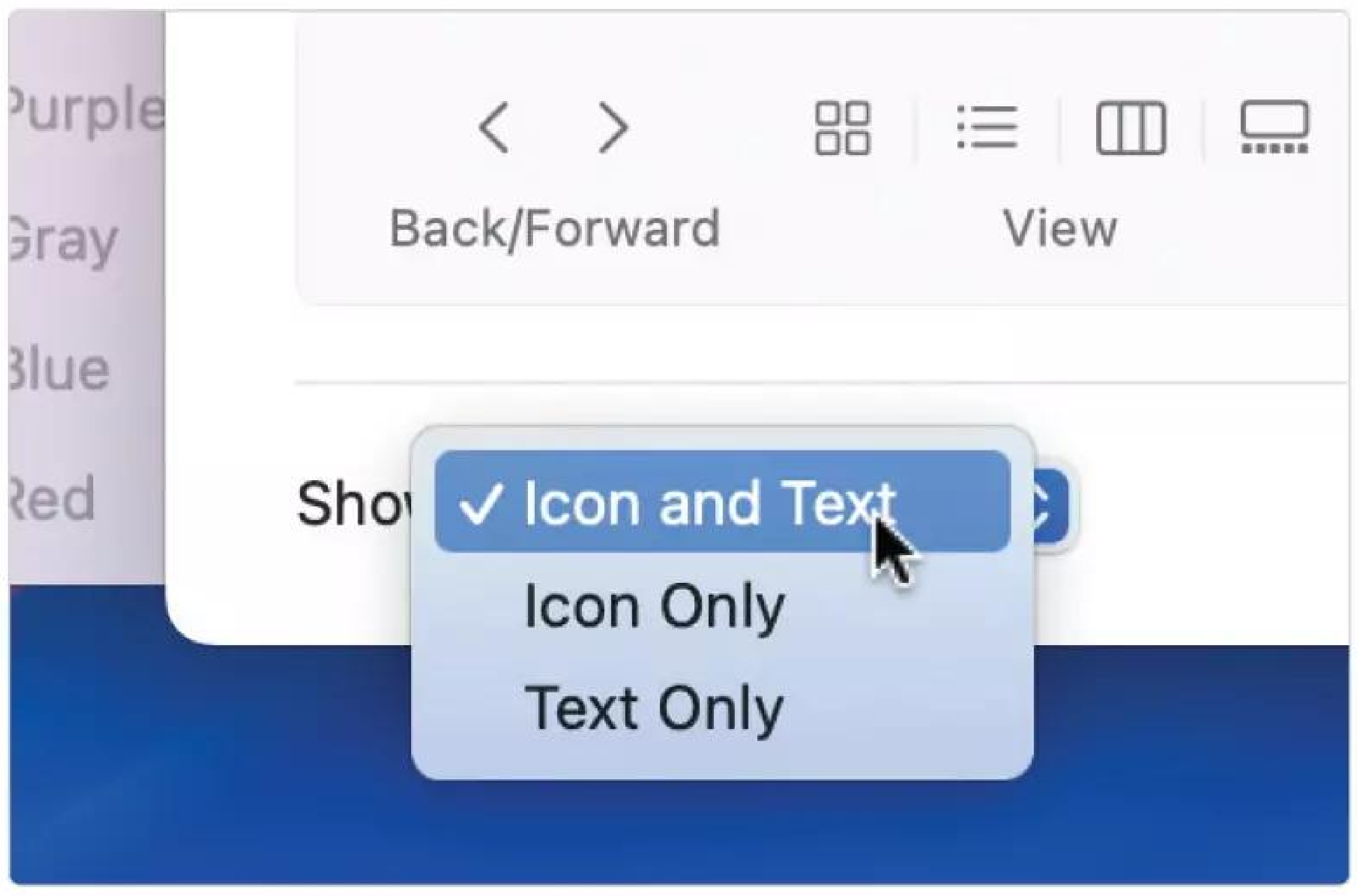
Drag your favourite items into the toolbar…

… or drag the default set into the toolbar.

Apple Mac
Back/Forward
Path
Group
View
Action
Eject
Burn
Space
Flexible Space
New Folder
Delete
Connect
Get Info
Search
Quick Look
Share
Edit Tags
Preview
AirDrop
iCloud
Dropbox

5 Rearrange items

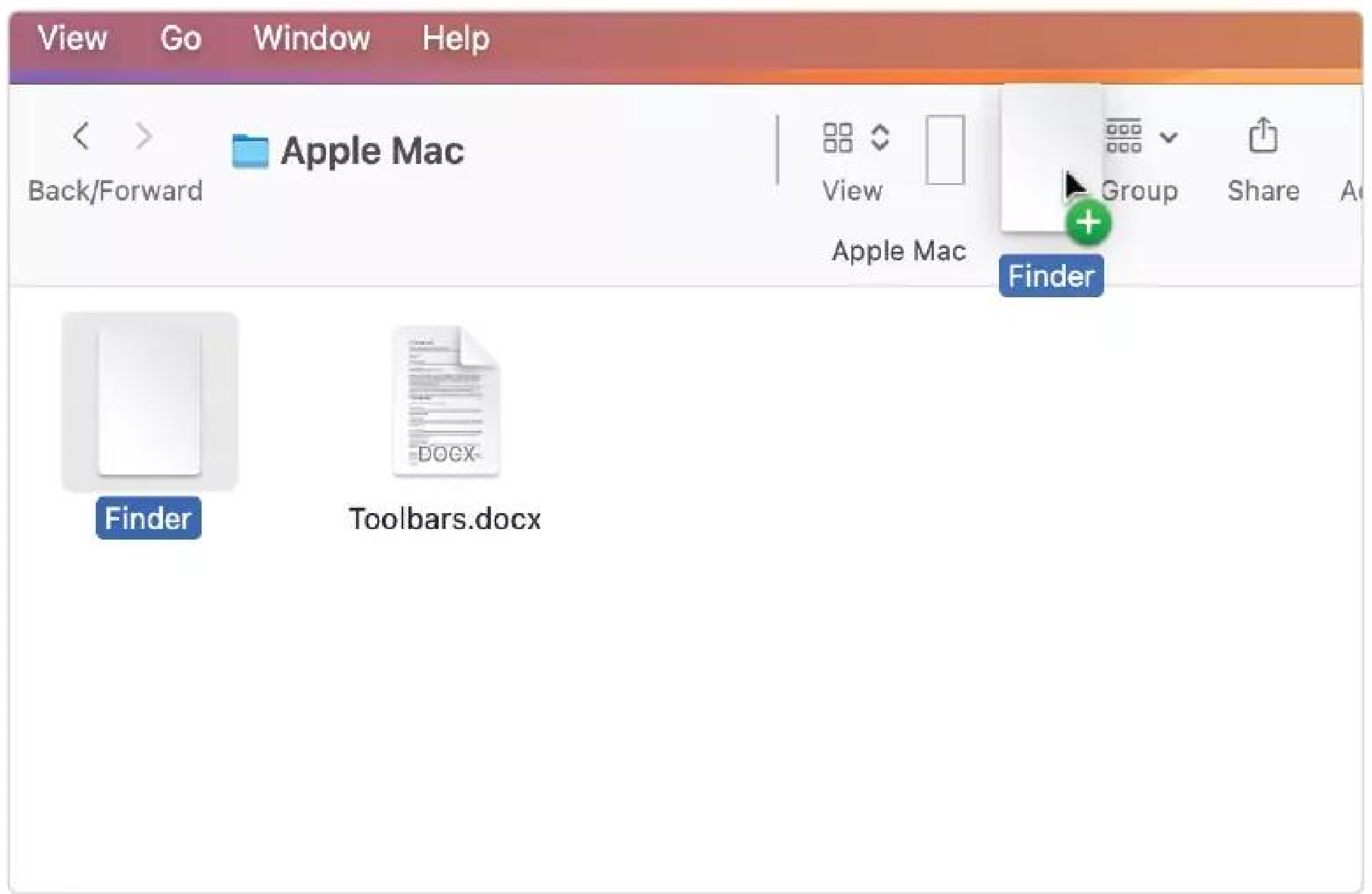
When you're in this edit mode, you can drag and drop icons within the toolbar to arrange them to your taste. But you can also rearrange items at any time by clicking them while you hold down the Cmd key.



Purple
Gray
Blue
Red
Back/Forward
View
Show
✓ Icon and Text
Icon Only
Text Only

6 Show text

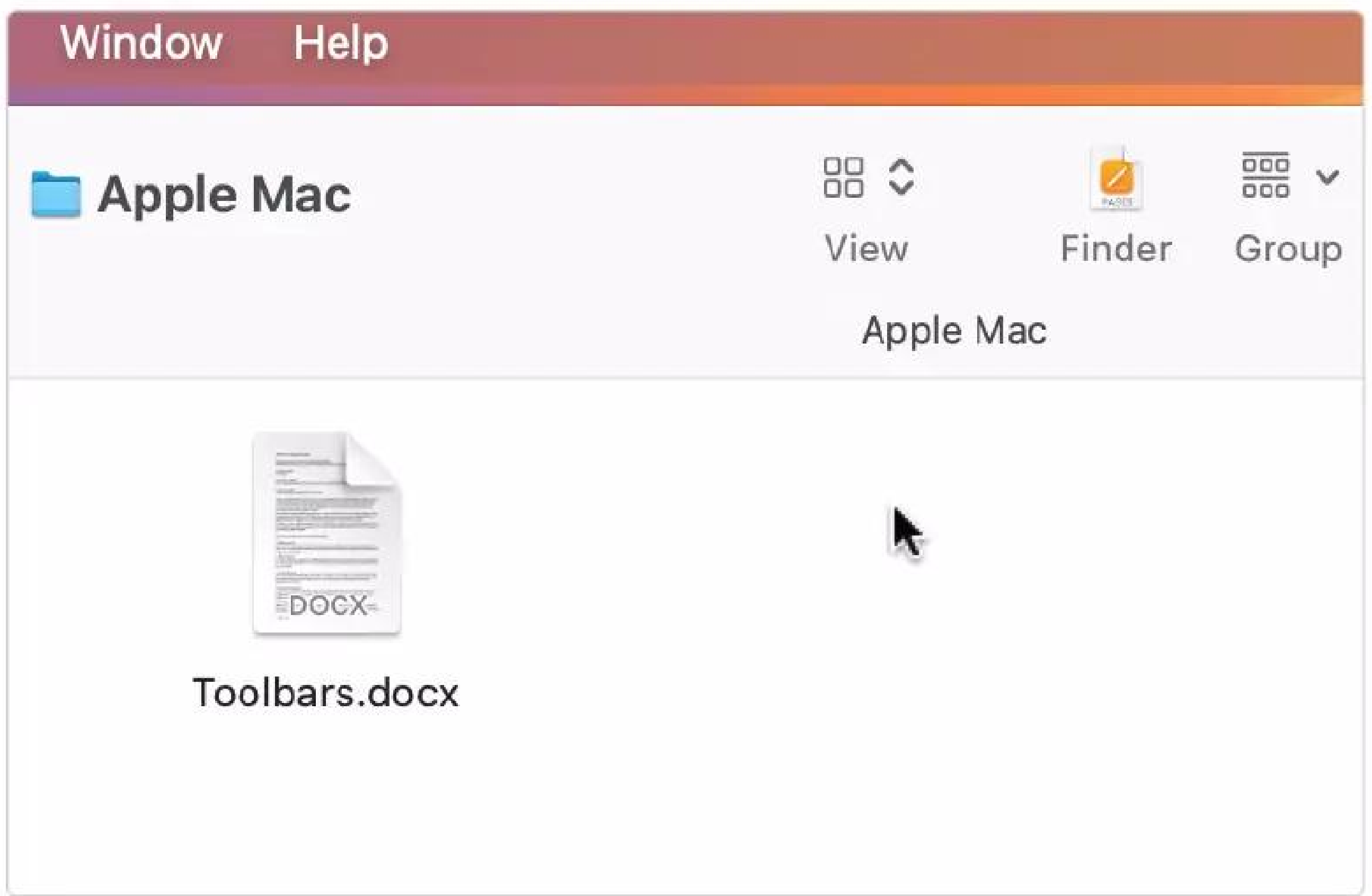
Finder and some apps can display text with toolbar icons – handy when getting used to a new layout. Click Show in the Customise window (or Ctrl-click the toolbar) and select 'Icon and Text'.



View
Go
Window
Help
Apple Mac
Back/Forward
View
Group
Share
Finder
Toolbars.docx

7 Add a file or app

In Finder, if you have any files, folders or apps that you regularly use, you can add these to the toolbar. You don't need to be in the Customise window – find the file, hold the Cmd key and drag it to the toolbar.



Window
Help
Apple Mac
View
Finder
Group
Toolbars.docx

8 Use the shortcut

Once you've added a file, folder or app to the toolbar, click the icon to open it. You can also open a file by dropping it on to an app in the toolbar and you can have multiple files, folders and apps stored there.

GENIUS TIP!
Don't want to see the toolbar at all? You can go to View > Hide Toolbar in the menu bar. Doing so in Finder will also hide the Finder sidebar.

Finder
File
Edit
View
Go
Window
Help
as Icons
as List
as Columns
as Gallery
Hide Sidebar
Hide Toolbar
Show Path Bar

GENIUS TIP!
The toolbar's default items can be quickly reinstated. Just go to View > Customise Toolbar, then drag the default set of toolbar items to the toolbar. area to revert.

Phone & tablet tips

Brilliant things to do on your device.

ANDROID

Share files with nearby devices using mobile data

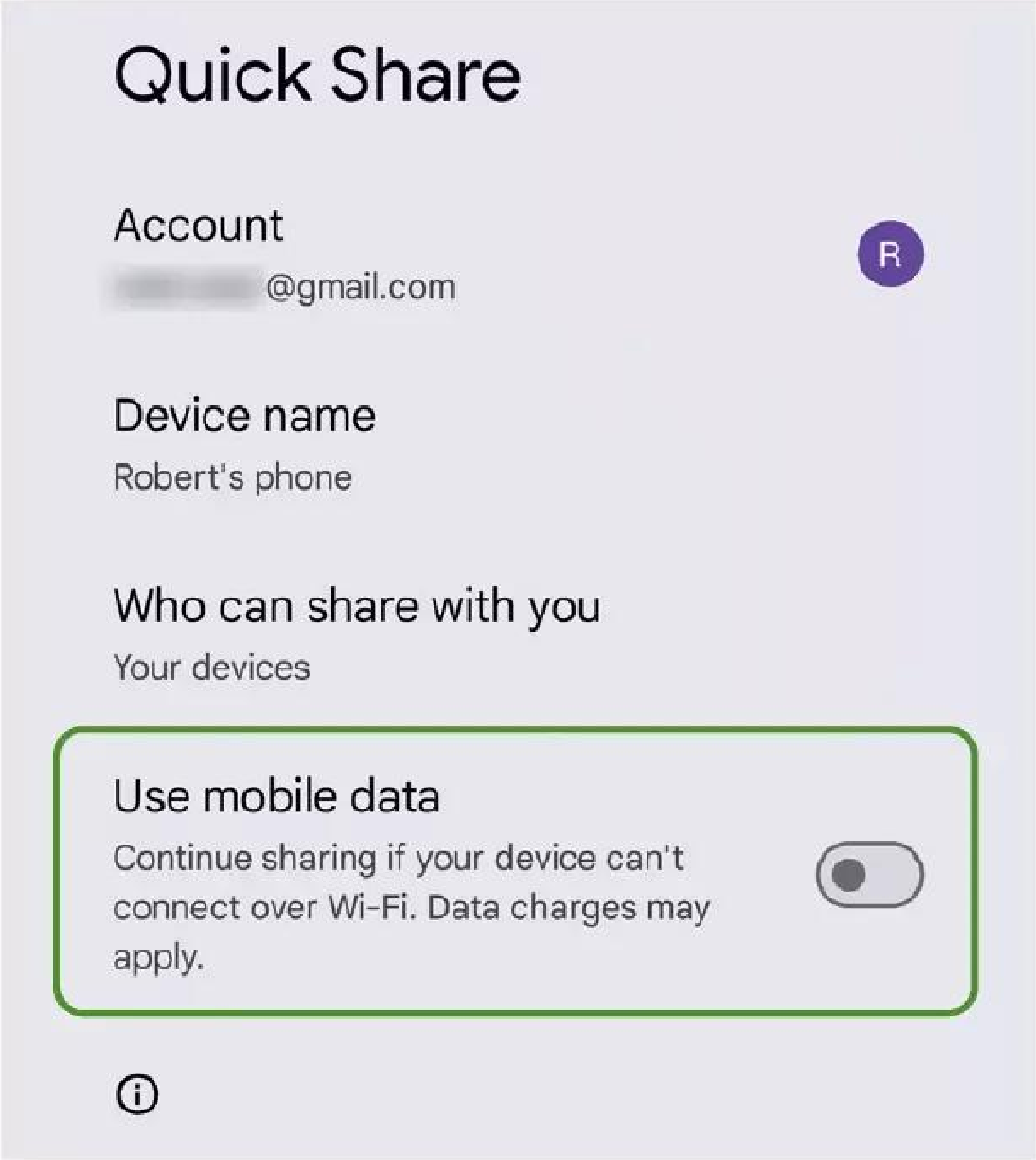
Google has updated the Quick Share feature for Android phones and tablets, which makes it easy to share files with nearby devices. Just tap the Share button at the top or bottom of the screen (depending on the app) and choose Quick Share to scan for and connect to nearby devices.

Previously, Quick Share used Wi-Fi to send files from one device to another, after establishing the initial connection using Bluetooth. It's now possible to share files over your mobile network when Wi-Fi isn't available.

This should ensure file transfers are always completed even if you lose your Wi-Fi connection before they've finished copying over. However, unless you're on an unlimited data plan with your mobile network, it could also eat into your monthly allowance.

The new option is enabled by default, but you can turn it off to reduce the risk of incurring data charges. Open the Settings app and choose 'Connected devices' then 'Connection preferences' – the setting may also be called 'More connectivity options'. Select 'Quick Share' and switch off 'Use mobile data' (see screenshot below left).

Quick Share also now lets you use QR codes to share files between nearby devices. Just tap the 'Use QR code' button on the Quick Share screen.



Quick Share

Account
[redacted]@gmail.com

Device name
Robert's phone

Who can share with you
Your devices

Use mobile data
Continue sharing if your device can't connect over Wi-Fi. Data charges may apply.

iOS

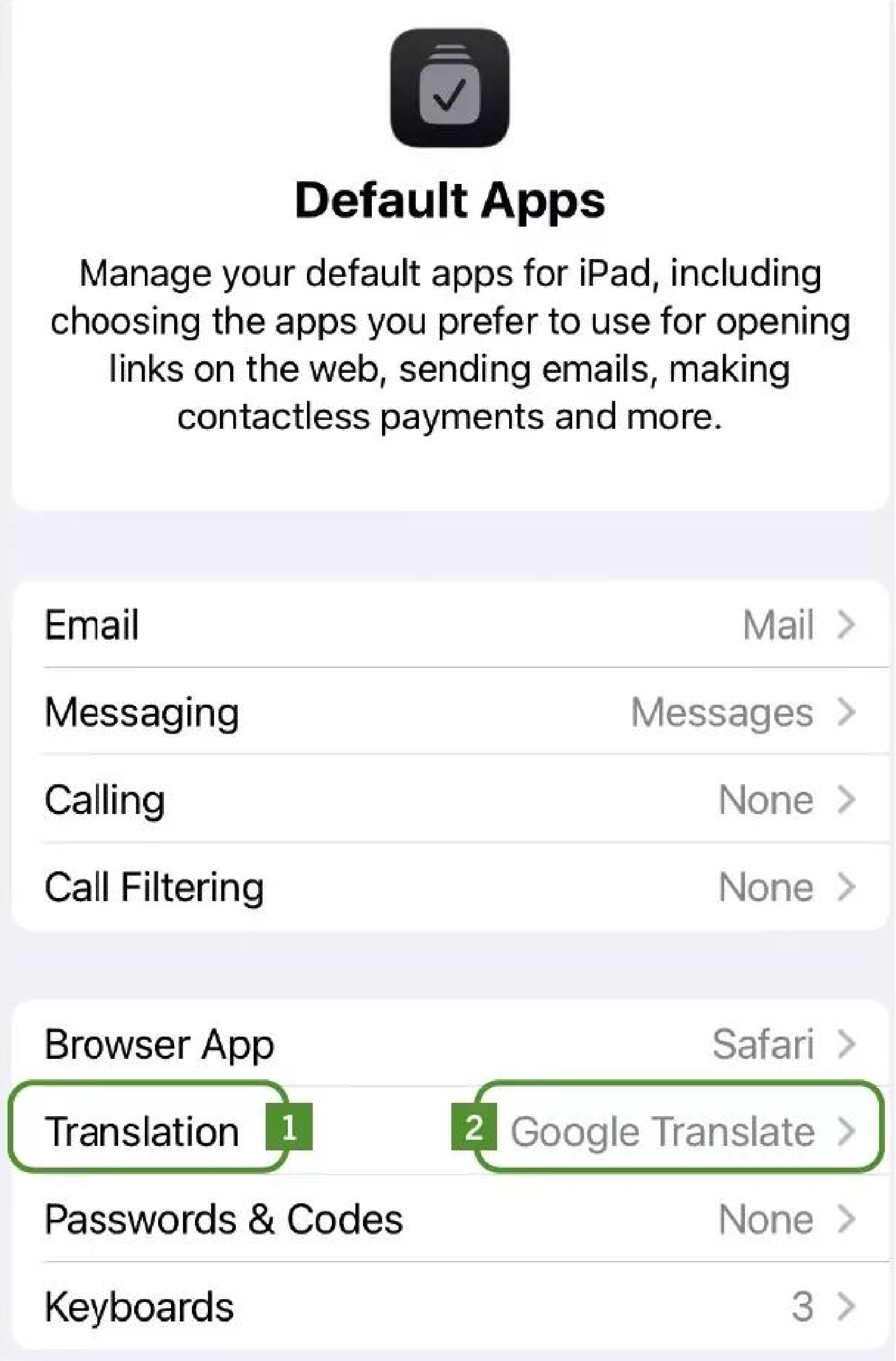
Set Google Translate as your default translation app

Even diehard Apple fans must admit that its Translate app isn't as good as Google Translate. It has a 2.2-star rating in the Apple App Store (**tinyurl.com/APC550apple**), where unimpressed reviewers call it "buggy" and "horrible".

Although you can install Google Translate (4.2 stars, **tinyurl.com/APC550translate**) on your iPhone or iPad, Apple Translate automatically carries out all translation requests, such as converting foreign text on web pages and asking Siri to translate a word or phrase.

Happily, following the release of iOS 18.4 – which lets you change some default apps – Apple now lets you set Google Translate as your default translation app. Update Google's tool to the latest version and it will handle all your translation needs, with support for more than 200 languages.

To switch from Apple Translate, open the Settings app and tap Apps followed by Default Apps. Select 'Translation' (1 in our



Default Apps

Manage your default apps for iPad, including choosing the apps you prefer to use for opening links on the web, sending emails, making contactless payments and more.

Email	Mail
Messaging	Messages
Calling	None
Call Filtering	None
Browser App	Safari
Translation 1	2 Google Translate
Passwords & Codes	None
Keyboards	3

Best new apps

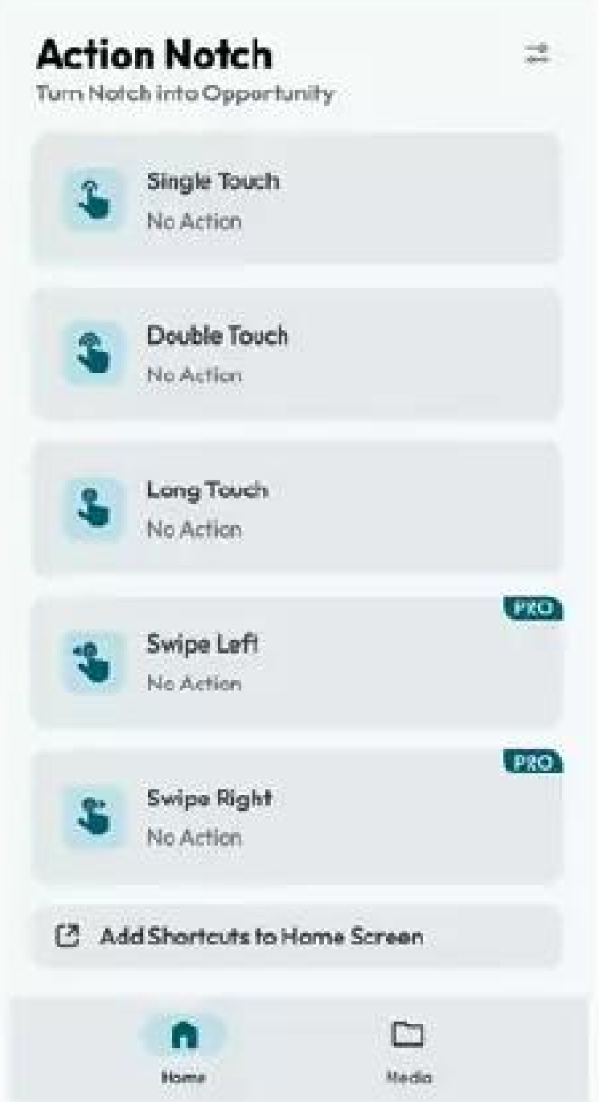
What you should install this month

ACTION NOTCH

Free*

Android tinyurl.com/APC550notch

This app turns the camera hole at the top of your phone's screen into a customisable button. You can then assign actions to perform when you tap or long-press this button, such as taking a screenshot, opening your camera or adjusting screen brightness. Tap 'Fix it' to grant Action Notch the required accessibility permission.



Action Notch
Turn Notch into Opportunity
Single Touch
No Action
Double Touch
No Action
Long Touch
No Action
PRO
Swipe Left
No Action
PRO
Swipe Right
No Action
Add Shortcuts to Home Screen
Home
Media

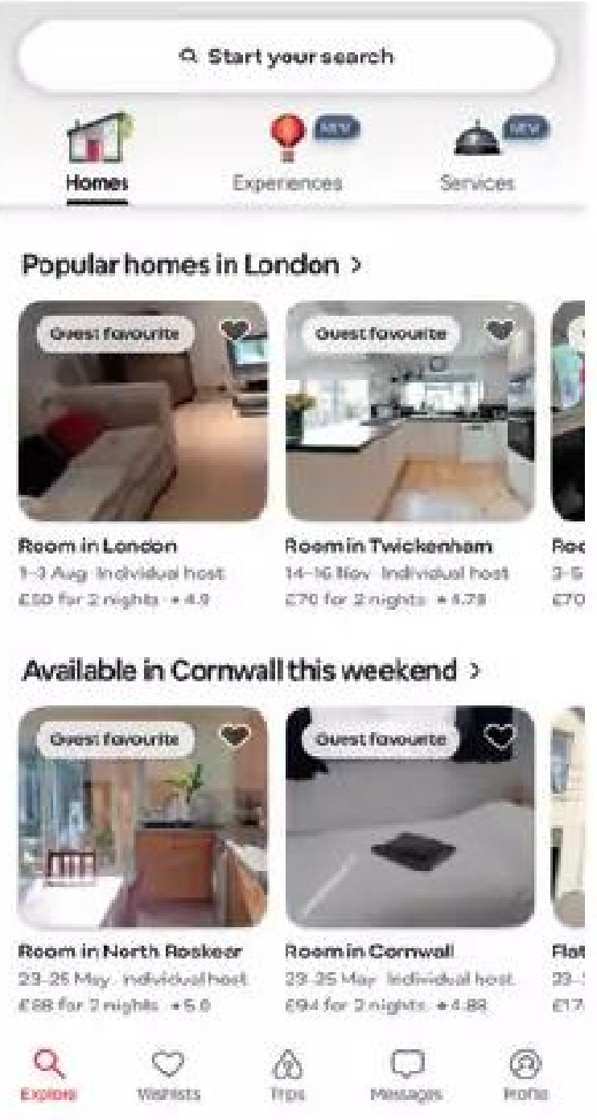
AIRBNB

Free

Android tinyurl.com/APC550air

iOS tinyurl.com/APC550airio

Airbnb's redesigned app includes a new Explore tab, which recommends places to stay in the following weekend or later in the year, and an updated Experiences section, which suggests things to do in popular cities. There's also a new Services feature, which lets you book personal trainers, photographers, chefs and masseurs through the app.



Start your search
Homes
Experiences
Services
Popular homes in London
Guest favourite
Room in London
Room in Twickenham
Available in Cornwall this weekend
Room in North Roskear
Room in Cornwall
Explore
Wishlists
Trips
Messages
Profile

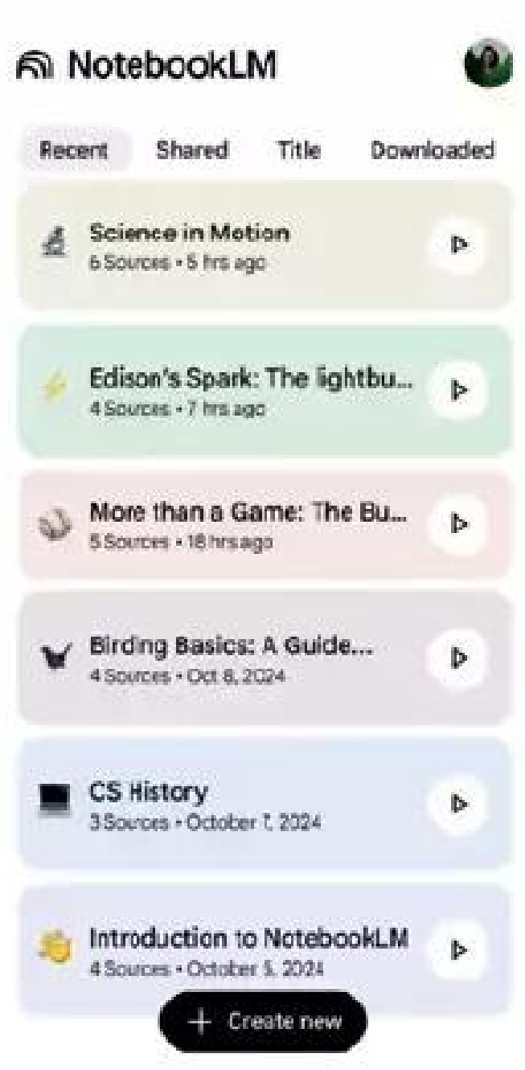
NOTEBOOKLM

Free

Android tinyurl.com/APC550note

iOS tinyurl.com/APC550noteio

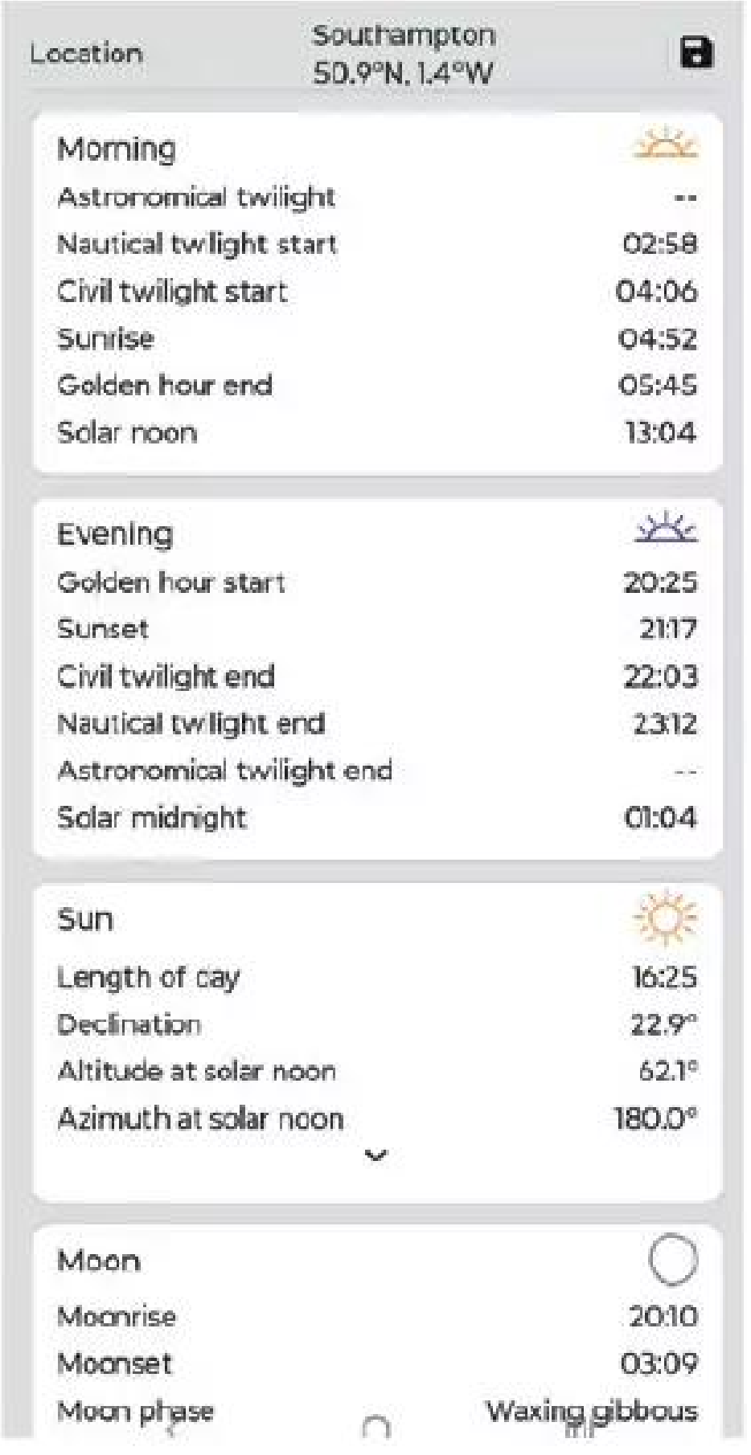
Google's brilliant AI-powered research tool now has a dedicated app for phones and tablets. Add documents, videos, web pages and other sources to NotebookLM and it will summarise and answer your questions about their content. Best of all, the app can turn your notebooks into podcasts using the Audio Overviews feature.



NotebookLM
Recent
Shared
Title
Downloaded
Science in Motion
6 Sources • 5 hrs ago
Edison's Spark: The lightbu...
4 Sources • 7 hrs ago
More than a Game: The Bu...
5 Sources • 18 hrs ago
Birding Basics: A Guide...
4 Sources • Oct 6, 2024
CS History
3 Sources • October 7, 2024
Introduction to NotebookLM
4 Sources • October 5, 2024
Create new

*Contains in-app purchases

Best apps for... Tracking things in the sky



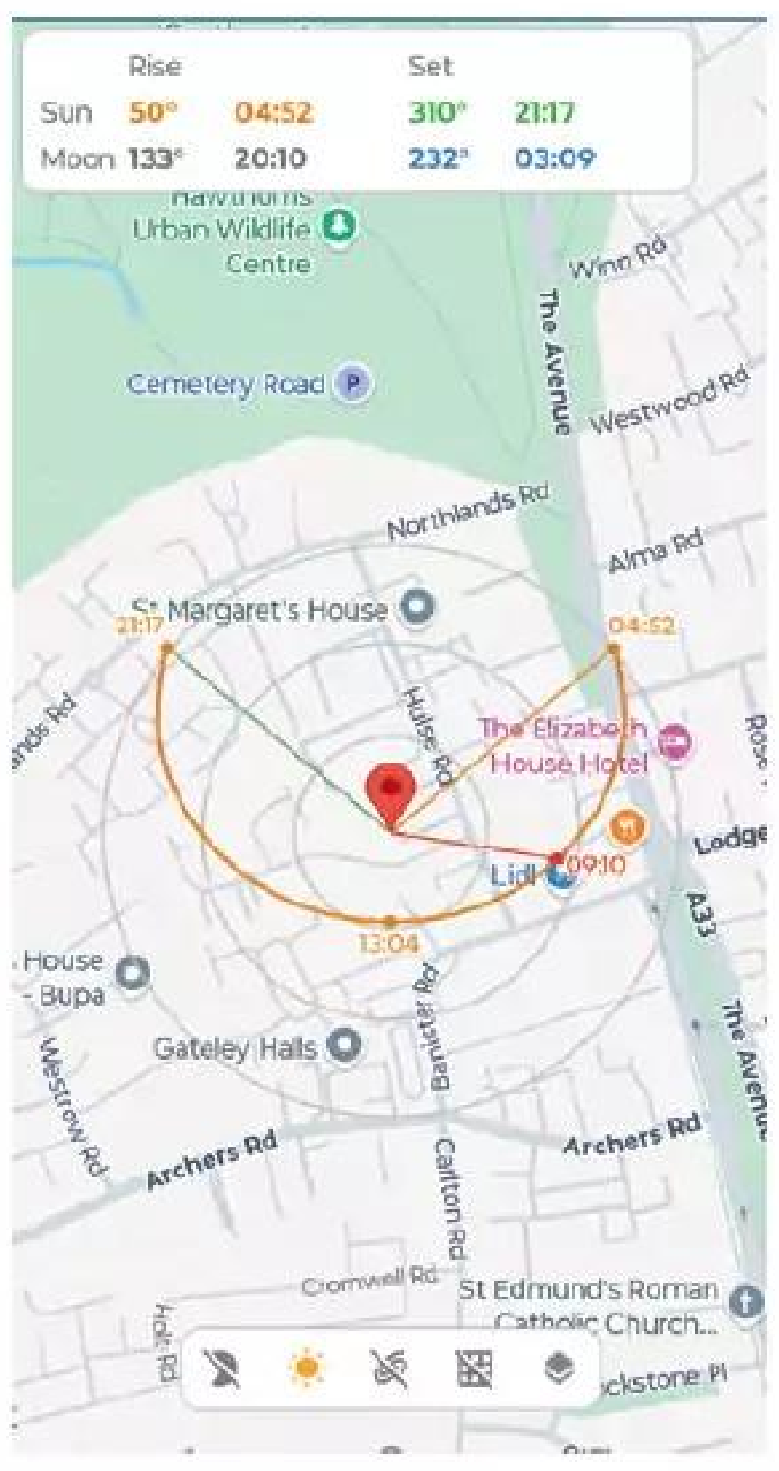
Location Southampton 50.9°N, 1.4°W

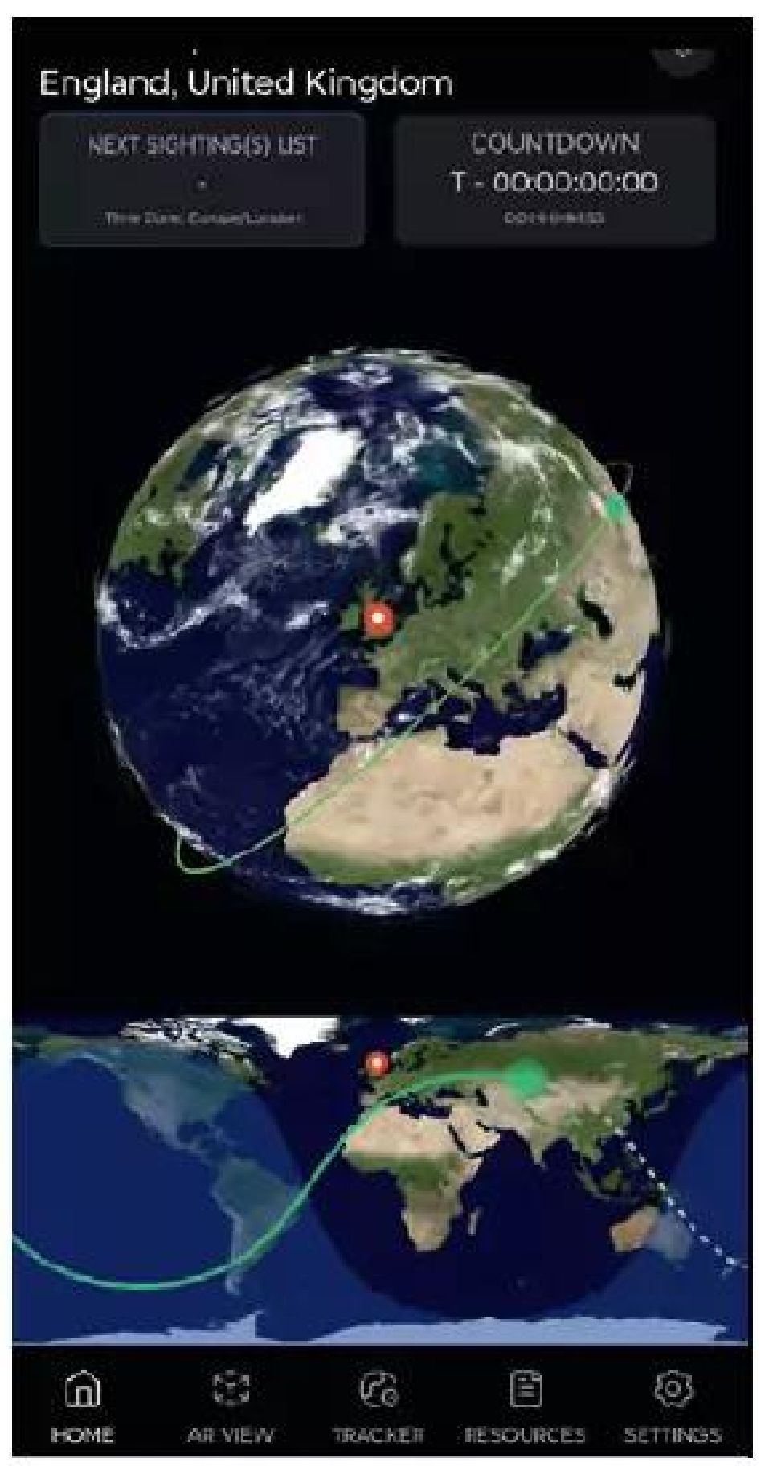
Morning	
Astronomical twilight	--
Nautical twilight start	02:58
Civil twilight start	04:06
Sunrise	04:52
Golden hour end	05:45
Solar noon	13:04

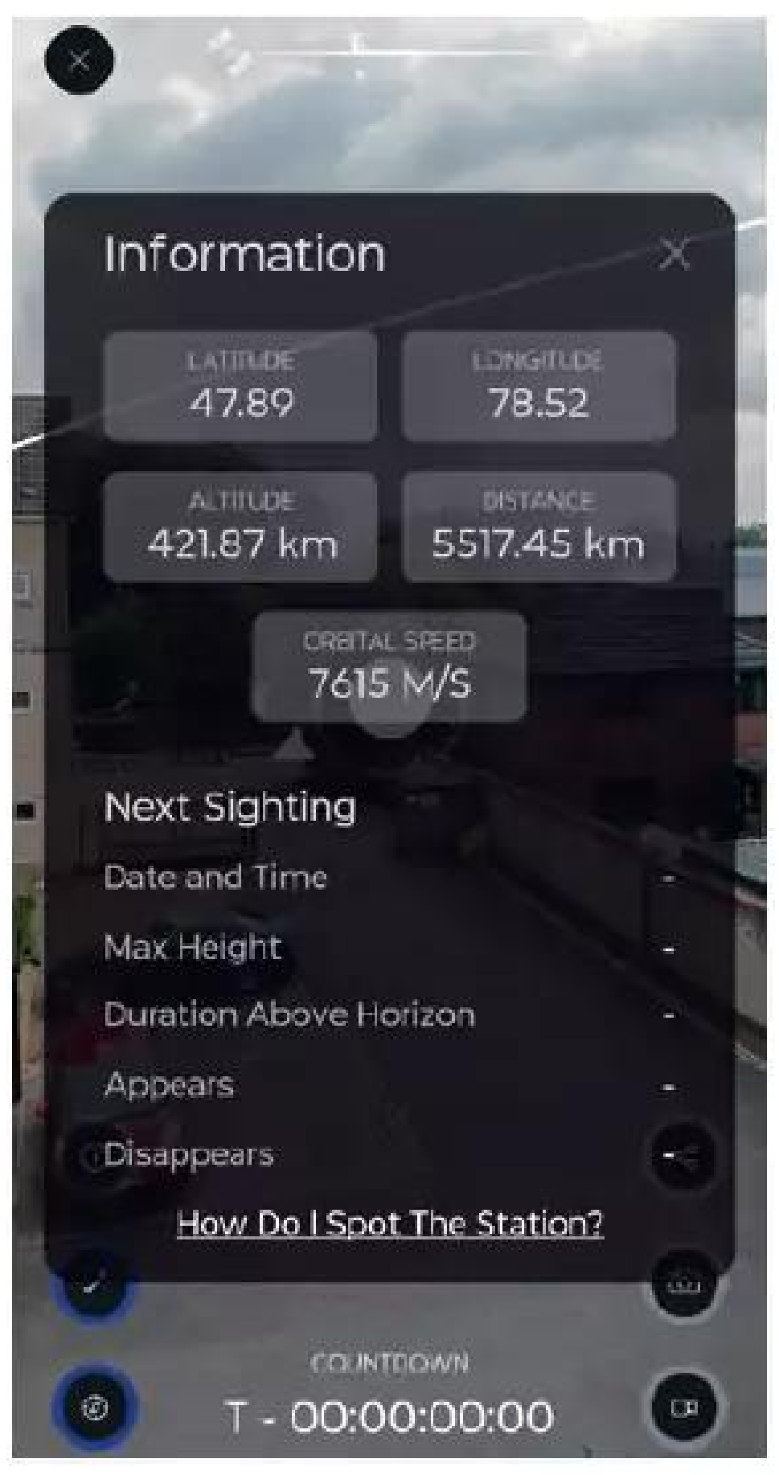
Evening	
Golden hour start	20:25
Sunset	21:17
Civil twilight end	22:03
Nautical twilight end	23:12
Astronomical twilight end	--
Solar midnight	01:04

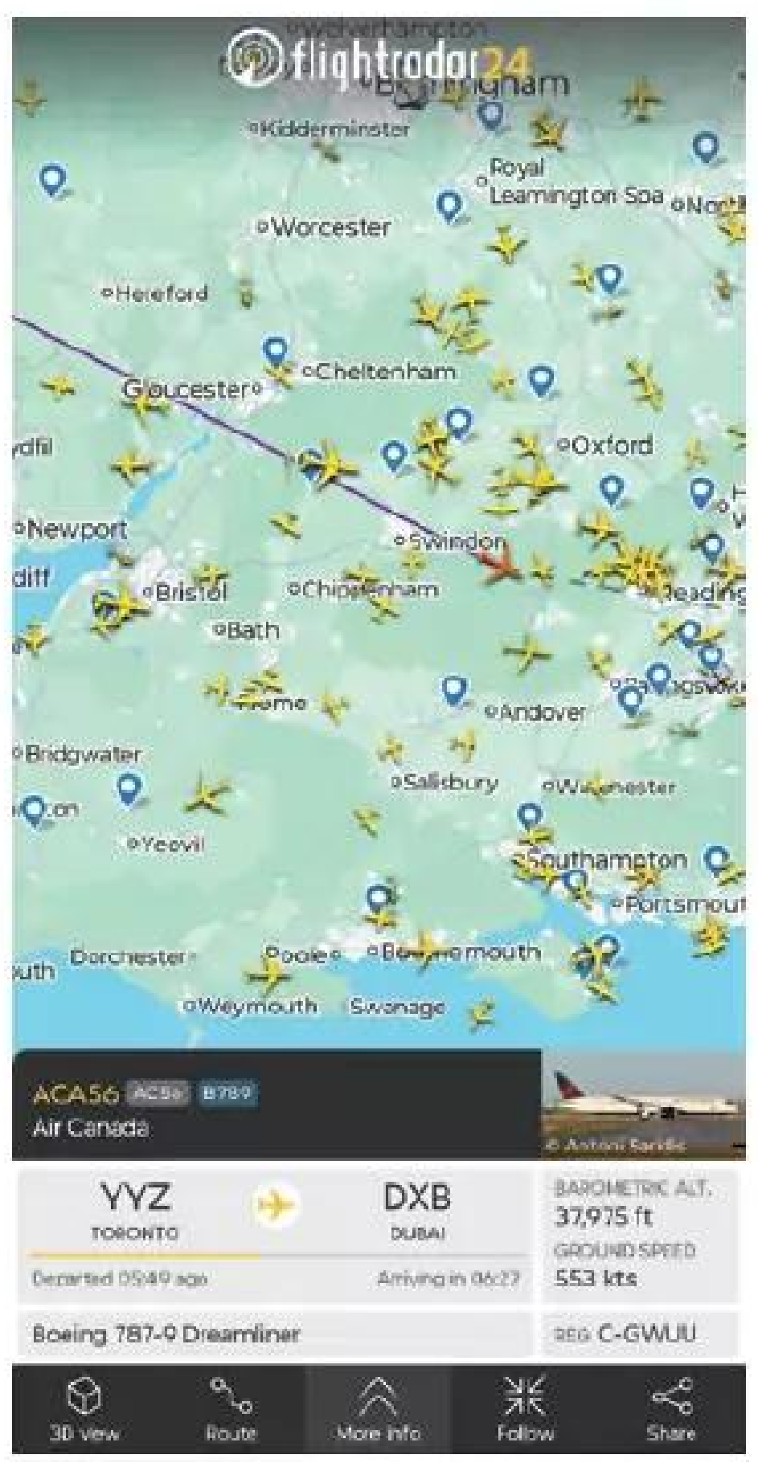
Sun	
Length of day	16:25
Declination	22.9°
Altitude at solar noon	62.1°
Azimuth at solar noon	180.0°

Moon	
Moonrise	20:10
Moonset	03:09
Moon phase	Waxing gibbous


Rise
Set
Sun 50° 04:52 310° 21:17
Moon 133° 20:10 232° 03:09
Cemetery Road
St Margaret's House
The Elizabeth House Hotel
Gateley Halls
Archers Rd
Westwood Rd
Northlands Rd
Alma Rd
St Edmund's Roman Catholic Church


England, United Kingdom
NEXT SIGHTING(S) LIST
COUNTDOWN
T - 00:00:00:00
HOME
AR VIEW
TRACKER
RESOURCES
SETTINGS


Information
LATITUDE 47.89
LONGITUDE 78.52
ALTITUDE 421.67 km
DISTANCE 5517.45 km
ORBITAL SPEED 7615 M/S
Next Sighting
Date and Time
Max Height
Duration Above Horizon
Appears
Disappears
How Do I Spot The Station?
COUNTDOWN
T - 00:00:00:00


flightradar24
Worcester
Gloucester
Cheltenham
Oxford
Swindon
Bath
Salisbury
Southampton
Bournemouth
YYZ
DXB
Boeing 787-9 Dreamliner

flightradar24
2
SESSIONS REMAINING
INFINITE FLIGHT
CESIUM
Bing Maps

SUN POSITION, SUNRISE & SUNSET

Free*

Android tinyurl.com/APC550sun

iOS tinyurl.com/APC550sunio

This app provides interesting information about the positions and paths of the Sun and Moon, including rising and setting times, and the start of the 'golden hour' beloved of photographers. It uses augmented reality (AR) to show the path of the Sun relative to your current location, and also displays its data visually on an area map.

Best For Tracking the sun

SPOT THE STATION

Free

Android tinyurl.com/APC550iss

iOS tinyurl.com/APC550issio

This official NASA app tracks the position of the International Space Station (ISS). Allow it access to your location, and 'Spot the Station' will start a countdown to the next potential sighting. It shows the station's trajectory on 2D and 3D global maps, uses AR to overlay its path on your current view and provides a live video stream from the ISS.

Best For Tracking the ISS

FLIGHTRADAR24

Free*

Android tinyurl.com/APC550flight

iOS tinyurl.com/APC550flightio

Flightradar24 is still the best app for tracking planes, though some features are limited to its paid-for plans. Thankfully they don't include its brilliant live air-traffic map, and you can unlock free sessions of its amazing 3D view by watching ads. Flightradar24 recently introduced a widget that lets you track popular flights from your home screen.

Best For Tracking flights

---

screenshot above) and choose Google Translate 2 to make it your default translation app.

ANDROID & iOS

Master the new options in Vivaldi

Vivaldi has updated its browser for Android (**tinyurl.com/APC550vivaldi**) and iOS (**tinyurl.com/APC550vivaldiio**), and as usual the two apps get some different new features. One addition common to both stops your search history and previously typed web addresses appearing in auto-complete suggestions.

Press the Vivaldi menu button, select Settings and tap Address Bar. Switch off the settings Show Typed History (1 in our screenshot left) and Enable Search History 2.

The Android browser now gives you one-tap access to Vivaldi's 'Reader view', when you want to remove all the clutter from web pages to focus on the text. Select 'Content Settings' on the Settings screen, tap Accessibility and switch on 'Reader view for web pages'. Next choose 'Appearance & Theme', activate 'Toolbar shortcut' and select 'Reader view for web pages'. This adds a shortcut to Vivaldi's toolbar that you can tap to de-clutter pages.

The iOS browser gains a useful option already available in the Android app, which allows audio to keep playing in the background when you switch tabs or use other apps. Go to Settings, tap General and enable the setting 'Allow media playback in background' ('Allow background audio playback' on Android).

ANDROID & iOS

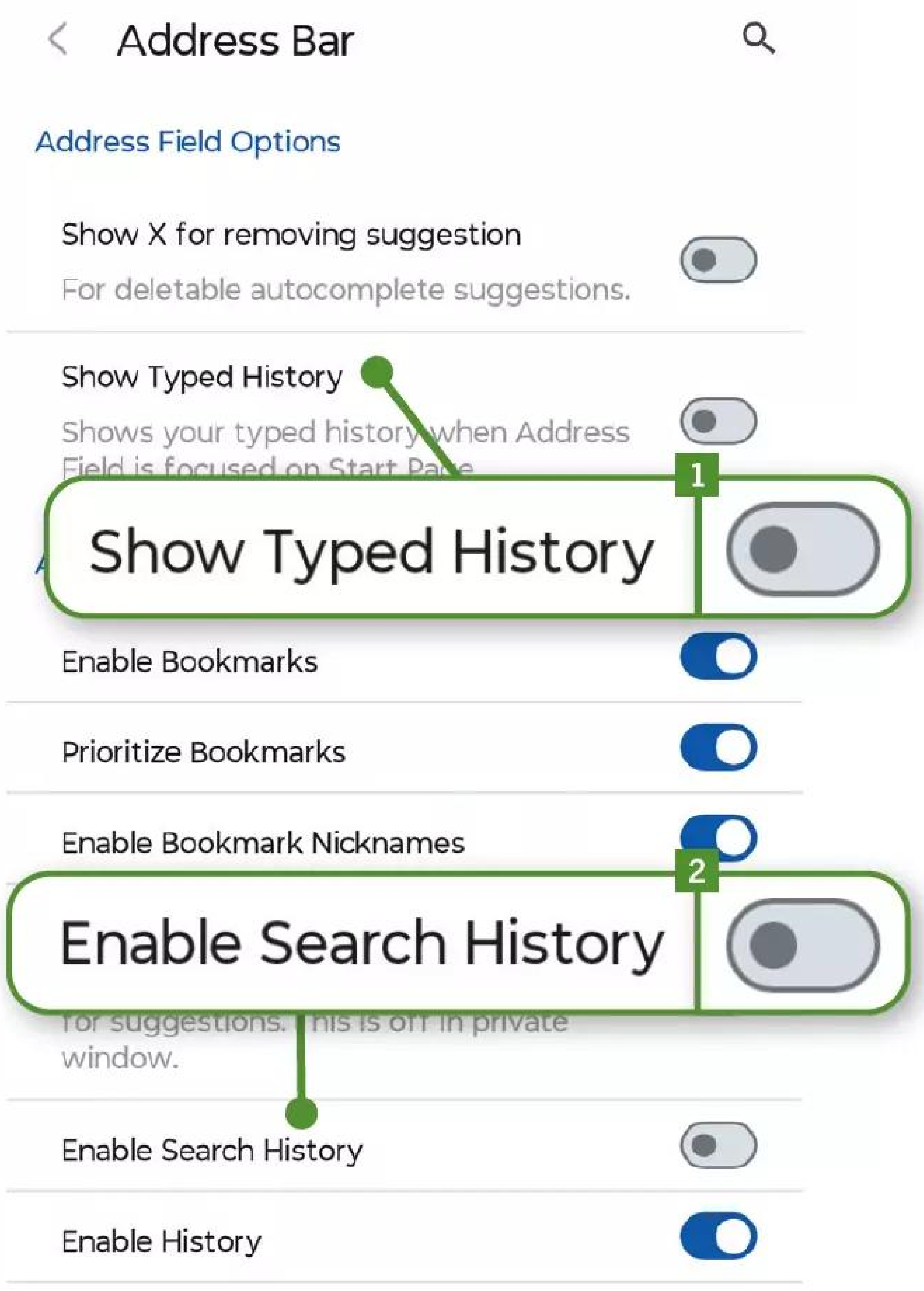
Don't lose your email drafts in Outlook

When you leave the 'New message' screen before sending an email, Outlook automatically saves a draft of the message for you to resume writing later. These abandoned emails are stored in your Drafts folder, where there's a risk you'll forget about them – meaning some messages never get sent.

To stop this happening, Microsoft has updated the Outlook app for Android (**tinyurl.com/APC550out**) and iOS (**tinyurl.com/APC550outio**) with the useful option to minimise your email drafts. This makes them much easier to retrieve than having to open the Drafts folder every time.

When you need to pause writing a message to do something else, tap the new Minimise icon in the top-right corner of the screen. This will minimise your email draft to a circular 'dock' next to the 'New email' button (see screenshot above).

Tap this dock to view a list of your saved drafts, then press a message to resume writing it. You can minimise as many emails as you want, and swipe left or right to remove them from the dock. ■



Address Bar

Address Field Options

Show X for removing suggestion ○
For deletable autocomplete suggestions.

Show Typed History ○
Shows your typed history when Address Field is focused on Start Page

1 Show Typed History ○

Enable Bookmarks ●

Prioritize Bookmarks ●

Enable Bookmark Nicknames ●

2 Enable Search History ○

for suggestions. This is off in private window.

Enable Search History ○

Enable History ●

apc HIGHLY RECOMMENDED

The city feels big, ramshackle, and lived-in.

PRICE $55 **PLATFORM** PC, XBS/X, PS5 **WEB** eriksholmgame.com

Eriksholm: The Stolen Dream

Scandinavian stealth is too strict for its own good.

***Eriksholm: The Stolen Dream* will dupe you. An isometric stealth game that puts you in control of multiple characters who each have their own abilities? You know what this is, surely? You'll think to yourself, "This is a *Commandos*, this is a *Desperados*, this is a game about combining and applying your characters' skillsets to creatively overcome obstacles." And you'll be wrong. Despite appearances, *Eriksholm* is a strict, tight, and mostly linear thing.**

There's more in common with *Hitman Go* than Shadow Tactics here: the job before you is not figuring out your own solution to its artisanal, bijou stealth encounters – it's poking at them until you figure out the precise solutions the devs intended, and getting spotted is an instant failure. Trying to cheese any of them invariably means a swift end and a return to an admittedly generous checkpoint.

So it's more stealth puzzle than stealth sandbox, but within those confines it's satisfying to figure out what each encounter wants from you, even if it doesn't feel especially creative. And gosh, what a looker. Never before have Scandinavian cops been so lustrously lit, their twitches and grimaces so minutely animated.

The game doles out new gameplay elements smartly as it goes on, and even as the story lost me I found my interest at least piqued by the new talents I was getting. Almost every new chapter adds some new gameplay wrinkle, challenging you to integrate a new skill into your toolbox to overcome the ever-more complex stealth puzzle boxes.

But when it comes time to put those skills to use? Every encounter feels fine-tuned to fail any attempt at outside-the-box thinking. Tightly honed patrol patterns mean you can't quite get bodies into cover before being spotted by a guard who spins around at the last nanosecond before you're safe.

They're not badly designed encounters. I felt smart when I cracked them and had fun in the process of doing so, but the trial-and-error means you run into an issue time and again where things feel like they ought to work, but don't, and that they would work in a game that kept a looser grip on the player.

It's an almost *Call of Duty*-ish approach to stealth game design that doesn't 100% work. But by its nature, stealth precludes the kind of bombast that might keep you engaged through a *CoD* shooting gallery.

There's lots to like in *Eriksholm* even if most of it never tips over into excellence. You can feel the bones of a special *Eriksholm 2* in there, just beneath that sun-starved skin. ■

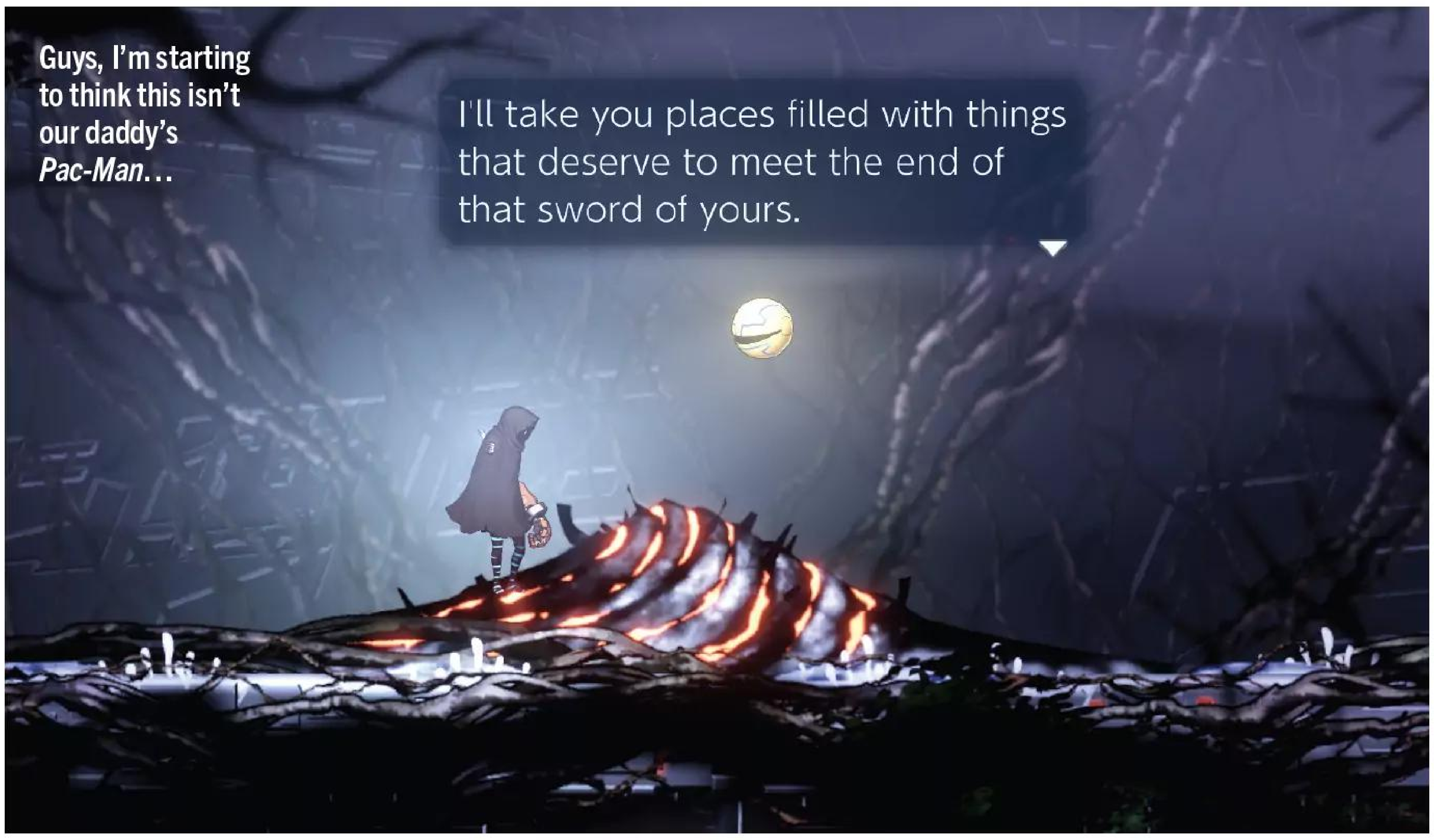
> "Almost every new chapter adds some new gameplay wrinkle, challenging you to integrate a new skill into your toolbox to overcome the ever-more complex stealth puzzle boxes."

VERDICT

★★★★☆

Beautiful, but *Eriksholm*'s stealth feels too constrictive to reach greatness.

Joshua Wolens



Guys, I'm starting to think this isn't our daddy's *Pac-Man*…

I'll take you places filled with things that deserve to meet the end of that sword of yours.

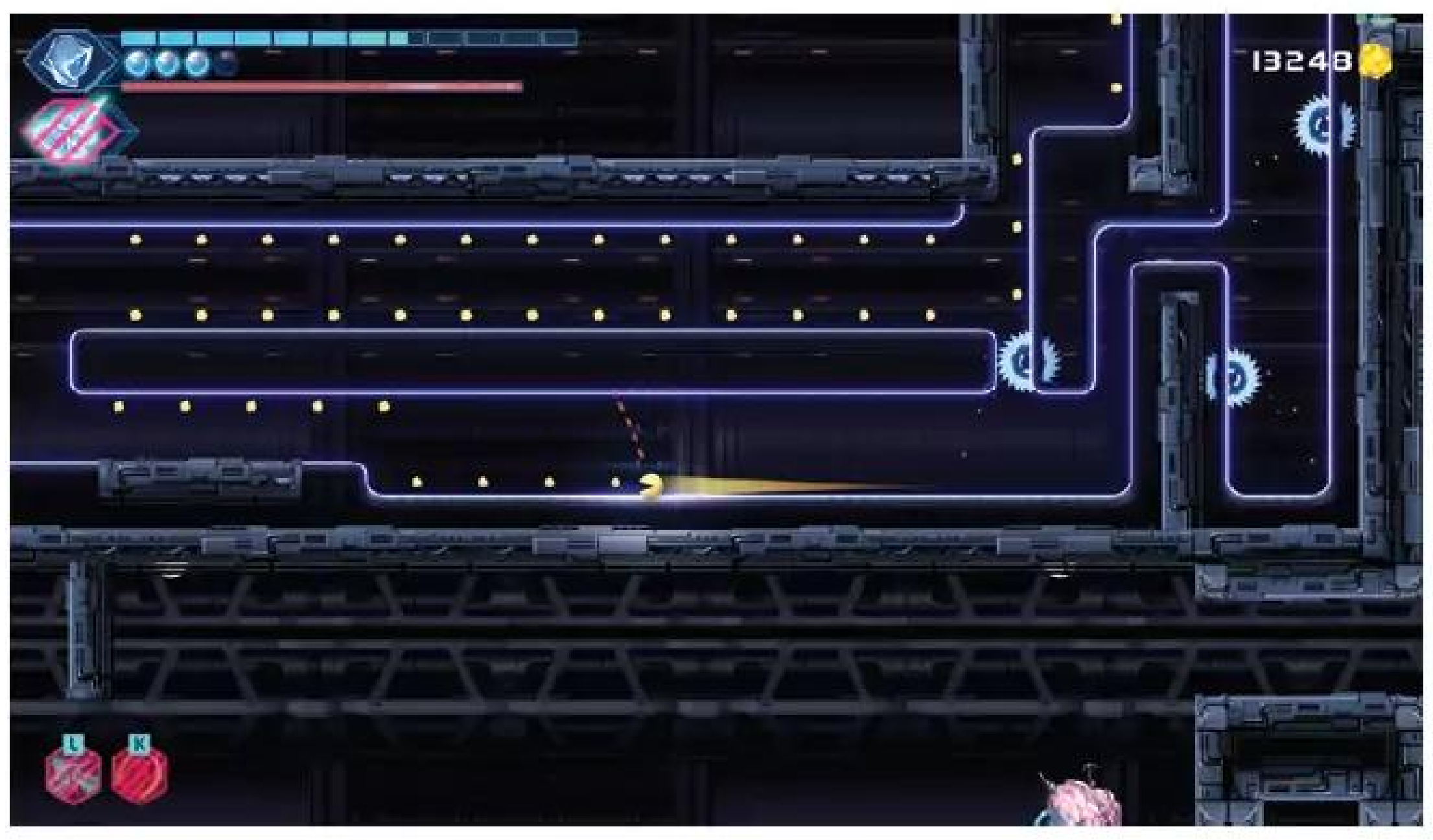
PRICE $39 **PLATFORM** PC **WEB** tinyurl.com/APC550shadow

Shadow Labyrinth

Pac-Man gets entertainingly miscast in this grimdark *Metroidvania*.

***Shadow Labyrinth* is a game in which Pac-Man helps you slaughter monsters with brains on the wrong sides of their skulls. Then he helpfully swallows their spines afterwards so you can spend them at the shop. Well, technically it isn't Pac-Man. Here your companion is called Puck, a cute nod to what was almost Pac-Man's name/a helpful distancing of this monster from being considered the real deal. Because Puck is a manipulative, untrustworthy devil on your shoulder who's unlikely to be fronting any Saturday morning cartoons anytime soon.**

From the moment you pick up a sword it becomes clear that this is going to be a slightly more routine adventure than the oddball premise suggests. Combat's a traditional hacky slashy affair, although Puck does enjoy swallowing the corpses afterwards. Chow down on enough fallen foes and you'll be able to turn into a giant invincible mech with a Pac-Man centre. Goofy fun, though I'd have liked to have seen munching woven into the combat more.



Some classic *Pac-Man* munching to remind you that you're not just playing this month's millionth *Metroidvania*.

After an overly linear opening few hours, the planet finally opens up, revealing a solid *Metroidvania* core. It's full of great navigation puzzles, platforming challenges, and poring over the map for secrets. And it's huge too. There's easily 40 hours of game here, even if a lot of that is because the difficulty curve suddenly decides to take inspiration from Pac-Man's horrible spiky mouth during the brutal climax.

The game gets more interesting when it leans into the *Pac-Man* of it all. Find and activate blue rails and suddenly you switch to playing as Puck, munching his way along them. A novel way to explore, and later sections that have you switching between the two playstyles make for some great platforming.

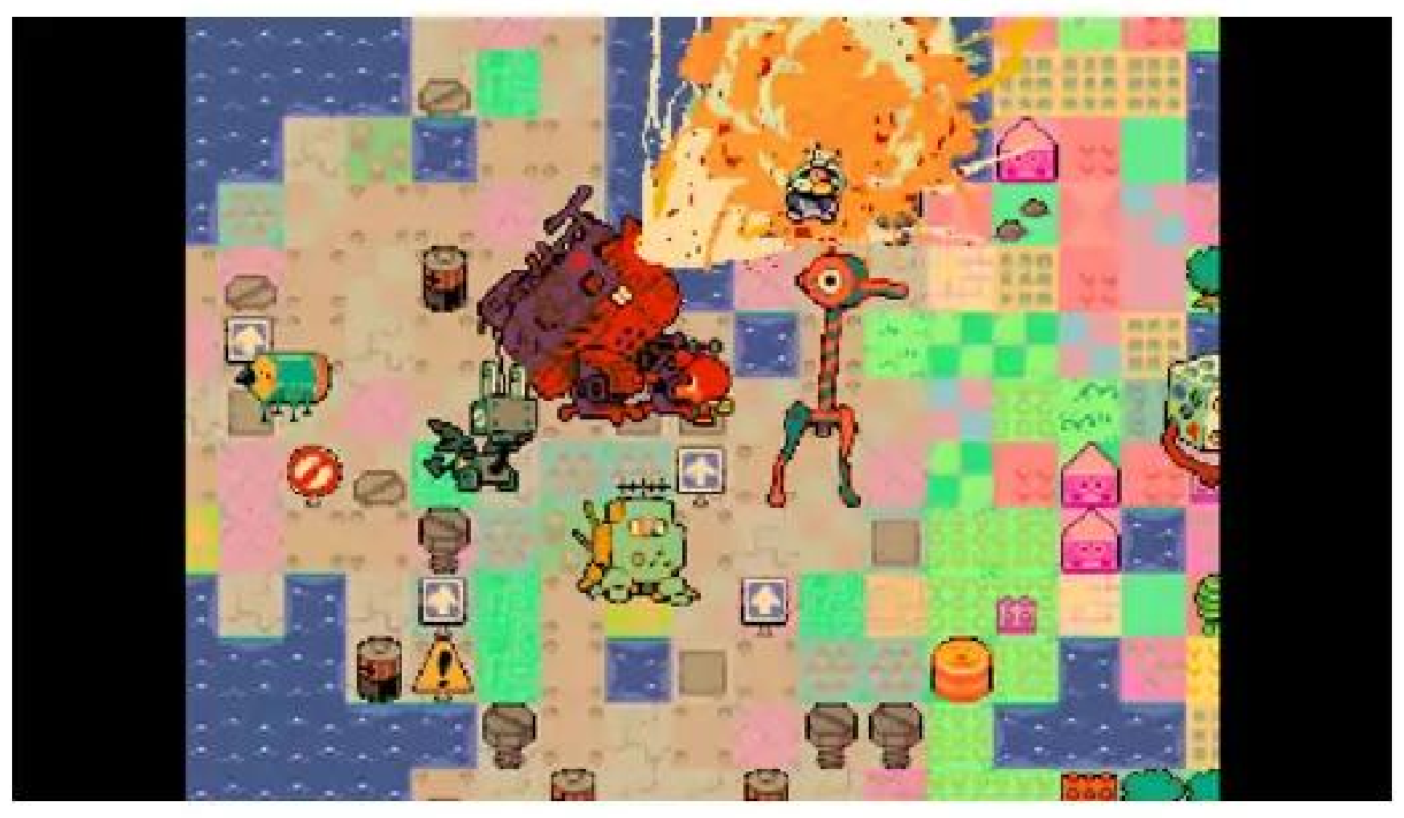
It's tough getting dramatic range out of a character who's a melon with a slice missing. The fact that *Shadow Labyrinth* hopelessly tries just reminds you what a silly idea a sombre reimagining was in the first place. ■

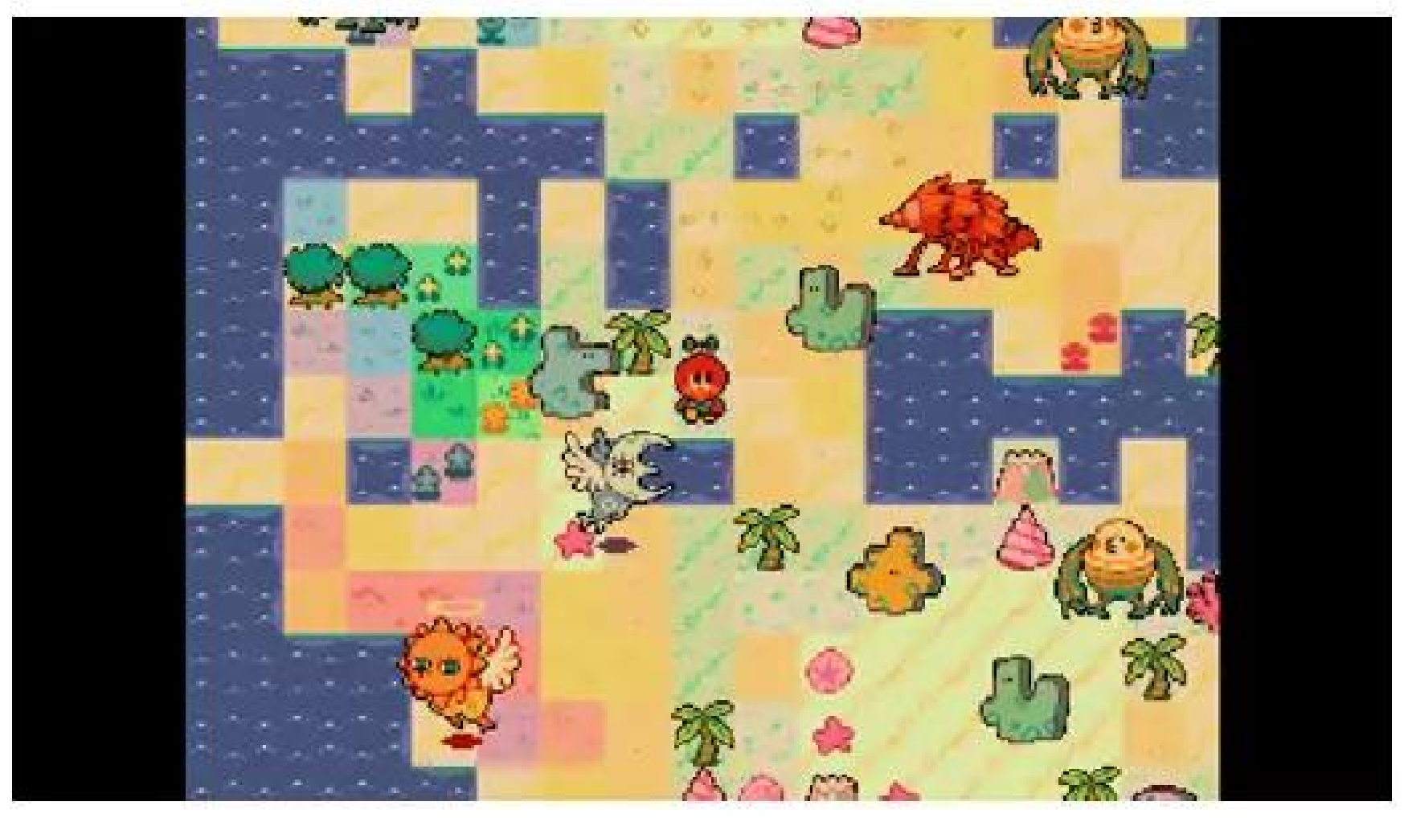
VERDICT

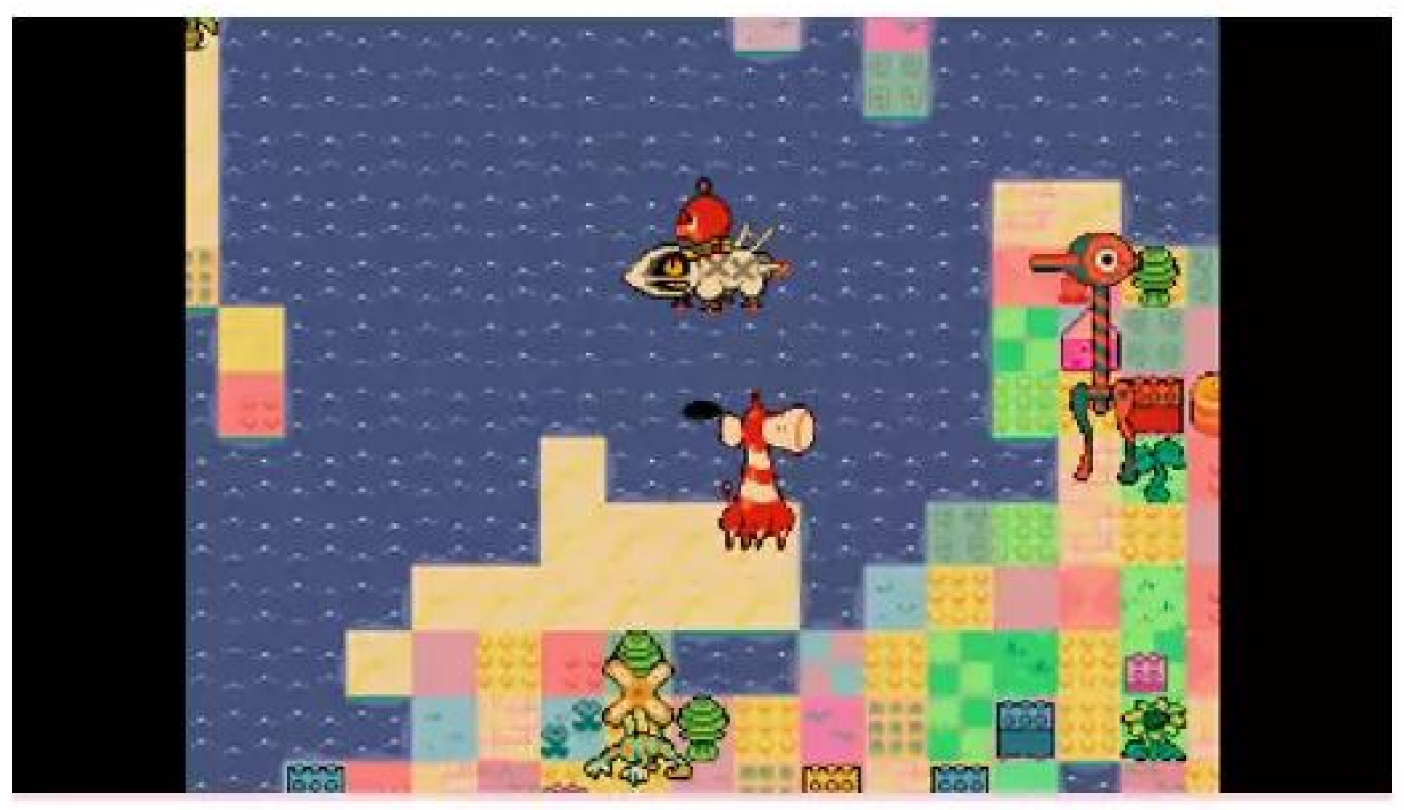
★★★⯪☆

Shadow Labyrinth from Bandai Namco is a good *Metroidvania* trapped in the shadow of too many better ones.

Abbie Stone







PRICE Free **PLATFORM** PC, Mac, Linux
WEB bit.ly/FormlessStar

FORMLESS STAR

PRODDING ALIENS TO SEE WHAT HAPPENS.

Formless Star is a game about visiting an alien planet and recording all the weird animals that live there. And there are some really fascinatingly strange creatures here. It's a game where you discover the creatures by sidling up and interacting with them. Every one of the 61 creatures (well, maybe not the last one, which is a special case), rewards your curiosity with a funny factoid, and more importantly with unique functions and animations.

That really is your only goal: to wander around the planet and interact with everything, with no barriers in the open world that can't be overcome, with a little perseverance. The planet is randomly generated every time you start.

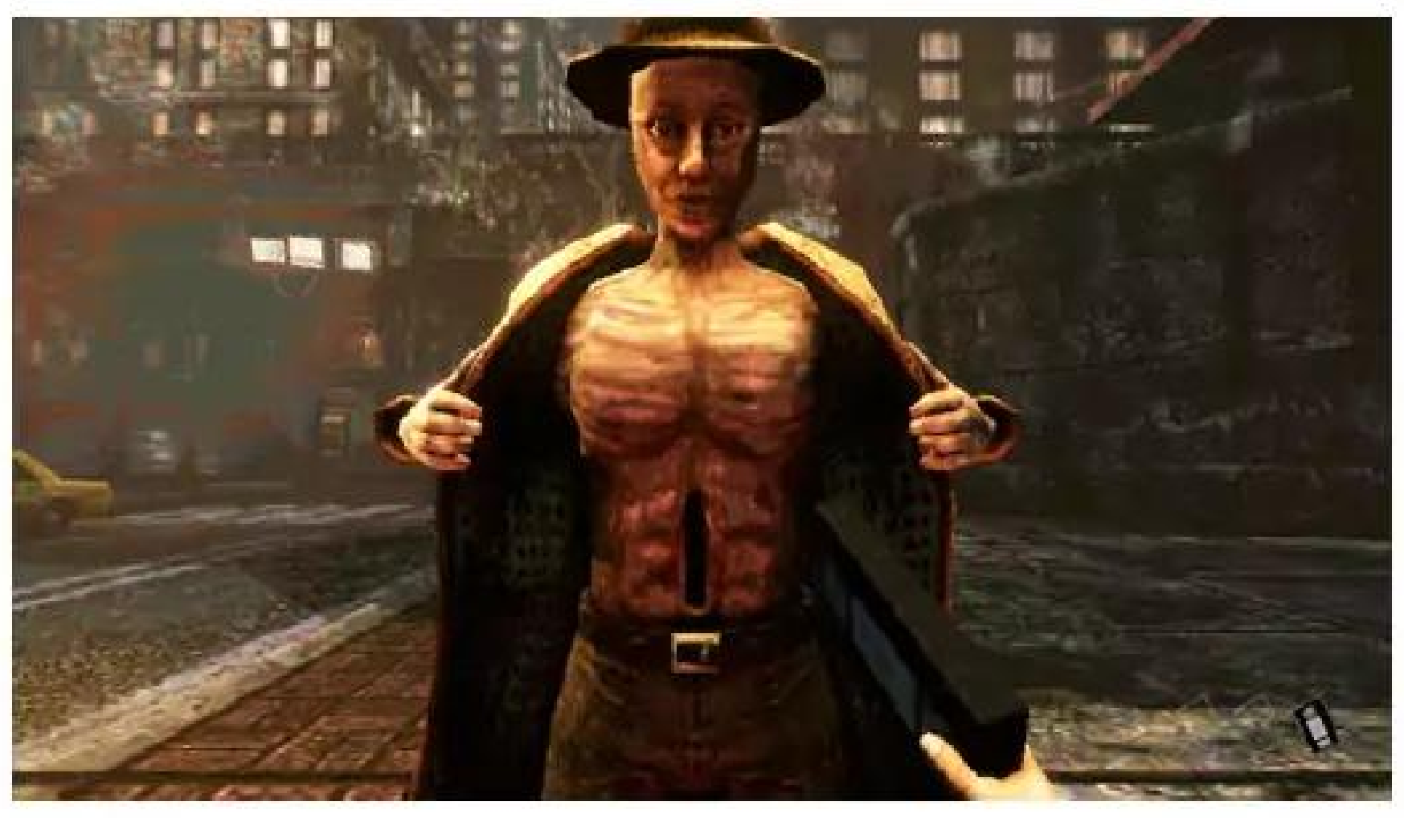
After two hours, I can't deny that weariness was settling in, but the in-game hints helped me discover the last few pesky animals. I'm glad I finished the game, because the final creature put this whole planet into perspective, enriching your achievement with a beautiful message.

VERDICT

★★★⯪☆

There's no danger, just good vibes and fun aliens in this touching exploration game.

Tom Sykes



PRICE Free **PLATFORM** PC
WEB bit.ly/TheNewFlesh

THE NEW FLESH

THE FLESH IS WILLING.

In this first-person exploration game, you've arrived in a weird parallel city looking for videotapes to cram into a flasher's abdominal cavity. This creepy fella is your first quest-giver, though to be fair the tapes aren't hard to find, as you explore a chunk of an empty city and get teleported to several fantastical locations. It's like someone lopped off a wing of Cosmo D's surreal exploration game *Off-Peak*, then made it a licensed tie-in for the band Red Vox.

So yes, that last bit: this game is sort of a promotional thing, containing a few songs from the band's upcoming album. These songs trigger as you enter certain locations, and usually accompany ambitious, playable sequences that contort or otherwise transform the environment around you. I'd never heard of the band, and I still know nothing about them other than that their pleasant indie rock music soundtracked these sequences pretty well.

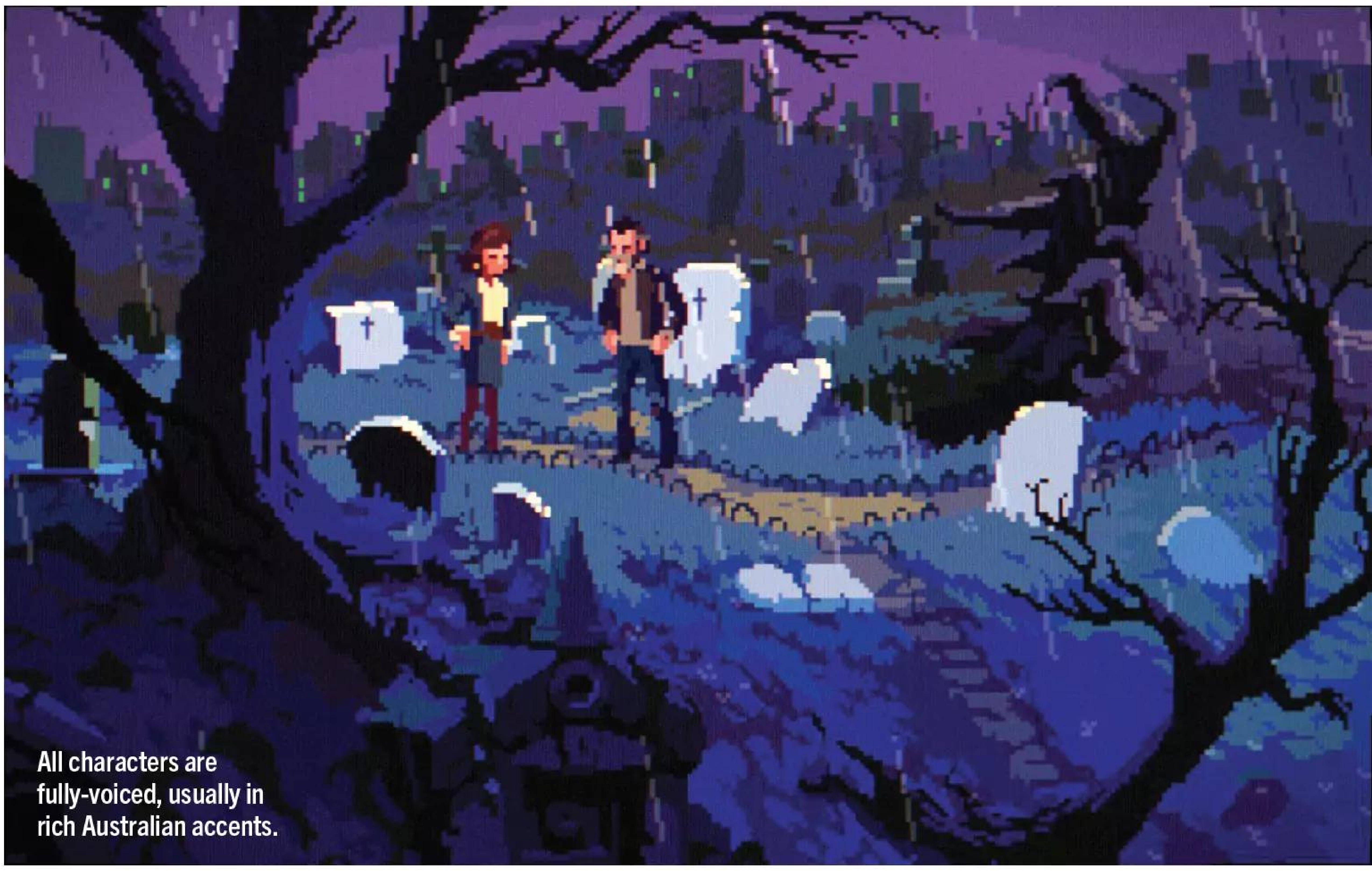
I'd urge you to give it a go if you want to witness some impressive visual effects and transitions.

VERDICT

★★★☆☆

Promo game or not, this is exciting stuff.

Tom Sykes



All characters are fully-voiced, usually in rich Australian accents.

PRICE $29 **PLATFORM** PC, Mac, Linux, Switch **WEB** thedriftergame.com

The Drifter

A gorgeous point-and-click with a noir-ish edge.

We meet Mick Carter as a homeless drifter. Due to some unspecified past trauma, he's abandoned his settled domestic life in a nameless Australian city for a self-flagellating transient existence. He's en route to home, where he's been beckoned to attend his mother's funeral. He does so reluctantly, because it draws him closer to a past he's deliberately abandoned.

The Drifter bills itself as a "pulp adventure thriller" and it wastes no time living up to that descriptor. Carter is a depressive but nevertheless oddly calm protagonist, with a familiar Australian matter-of-factness about him. He's downcast, but not entirely ruined. In fact, when a hi-tech conspiracy begins to loom he proves quite resourceful: *The Drifter*'s point-and-click trappings generally demand *MacGyver*-like logic, which is to say, an ability to use mundane objects to solve seemingly insurmountable problems.

But *The Drifter* has quieter, ostensibly more complex ambitions. At first the world presents as a richly down-at-heel urban sprawl. Its lavishly illustrated environs are a potent combination of John Carpenter blight with film noir tactics. Powerhoof's pixel art strives towards a painterly, oddly curvaceous semi-realism, darkness and undulating shadows rendering a bleak and forbidding world that still manages to be tastefully colourful and varied. The studio has a distinctive approach to pixel art, which is no small feat.

The point-and-click elements are familiar. Puzzles tend to boil down to executing actions in the right order, combining found objects to make a jury-rigged tool, or compelling certain events to occur to accommodate my objectives. Powerhoof has devised a clever user interface that takes a lot of the tedious guesswork out while also providing information about present circumstances, lest one lose their way.

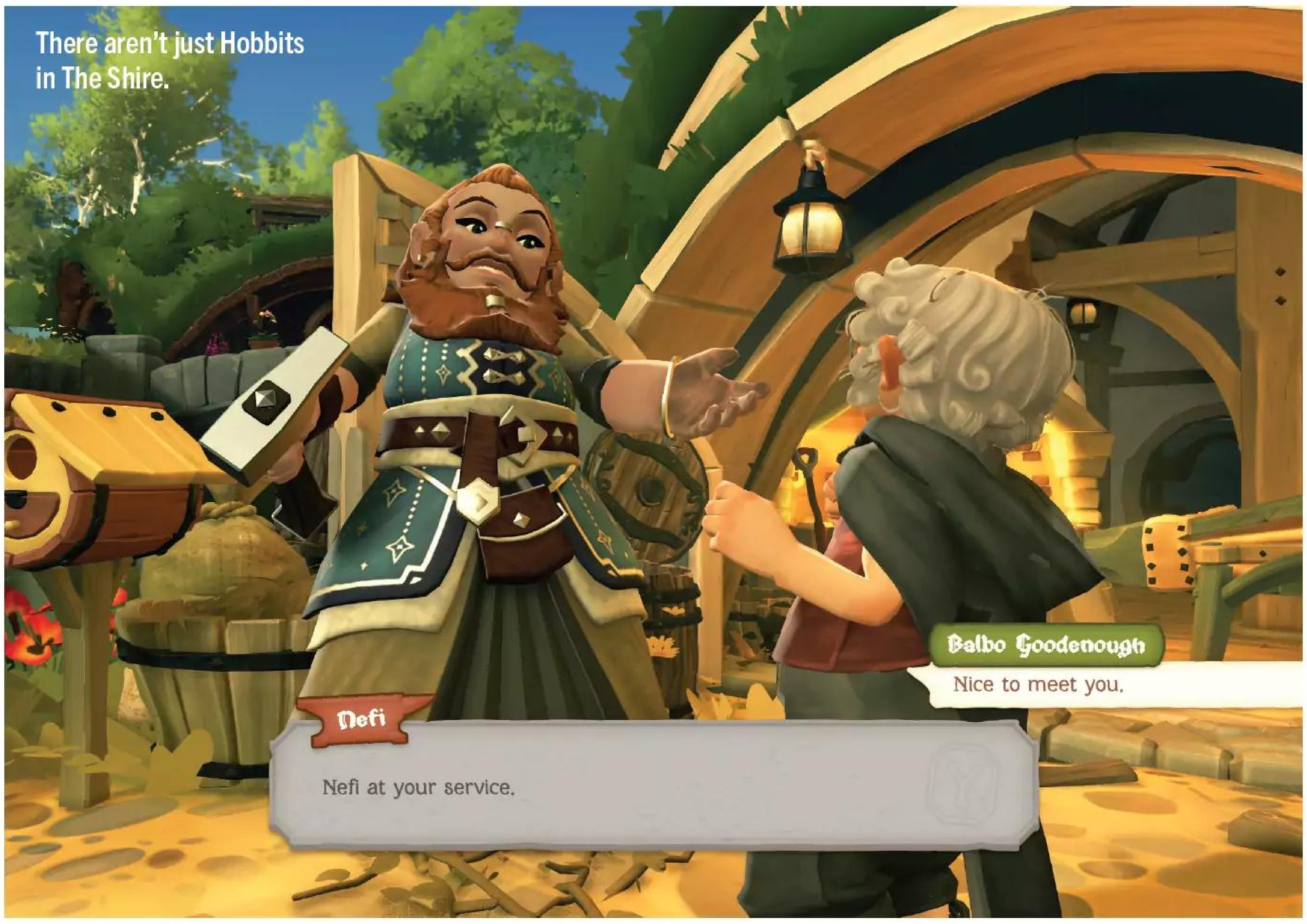
The Drifter is a finely wrought point and-and-click adventure, with gorgeous art, but its pulp tendencies sit a bit askew from some of its more severe themes. The source of Carter's jiltedness rubs awkwardly against the high concept sci-fi narrative, which of course involves time travel, albeit towards bleaker ends than the usual "just one more chance" fantasy. ■

VERDICT

★★★☆☆

A gorgeous and moody adventure with impeccable art, but its pulp leanings undermine its best qualities.

Shaun Prescott



There aren't just Hobbits in The Shire.

Nice to meet you.

Nefi at your service.

PRICE $49 **PLATFORM** PC, PS5, XBS/X, Switch **WEB** tinyurl.com/APC550lotr

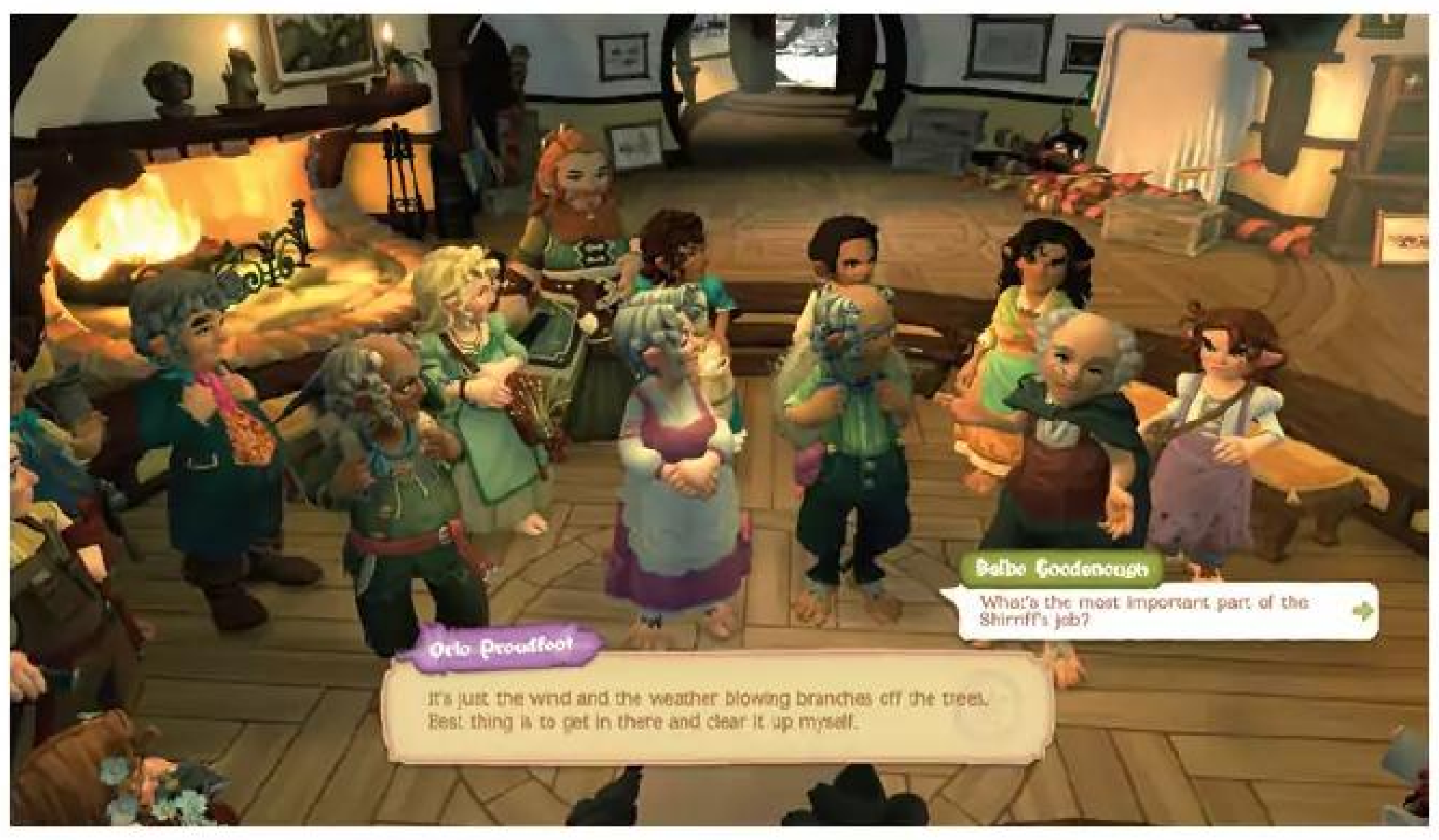
Tales of the Shire: A The Lord of the Rings Game

How to make friends with food.

In *Tales of the Shire: A The Lord of the Rings Game* I cook, I fish, I farm – but most of my time is spent using my big ol' hairy feet to skip back and forth between the dozen hobbits who regularly need my help.

Luckily, there's a great way for an outsider to earn the trust of the local halflings, and that's through their stomachs. Cooking in *Tales of the Shire* is excellent. The ideal version of the meal you're making has a little target on your cooking HUD, and hitting it means adjusting the smoothness or chunkiness of the dish (depending on how vigorously you chop the ingredients) as well as the crispness or tenderness (which can be fine-tuned in the frying pan, saucepan, and other kitchen implements). While the stovetop is sizzling you can also mix in extra flavours at each step, adding sugar, salt, cinnamon, butter, and lots of herbs and spices to make flavour combos that improve the quality of the meal.

It's a fun and tactile minigame I enjoy each time I do it. I just wish the rest of Tales' systems were as enjoyable as its cooking – and I wish there were more to do in general. Quests require a lot of running back and forth between hobbits to deliver messages and have short conversations. The main quest is a long one, to elevate the town to official status in the Shire, but to spread it out over the course of the game there are often gaps where you simply have to wait for the next part to begin by ending the day and starting the next. A lot of quests are of the 'the princess is in another castle' variety: while trying to track down a missing book, each hobbit I questioned sent me to another, and then another. It's a lot of running around, and frankly, I'd much rather be at home cooking. ■



It's just the wind and the weather blowing branches off the trees. Best thing is to get in there and clear it up myself.

What's the most important part of the Shirriff's job?

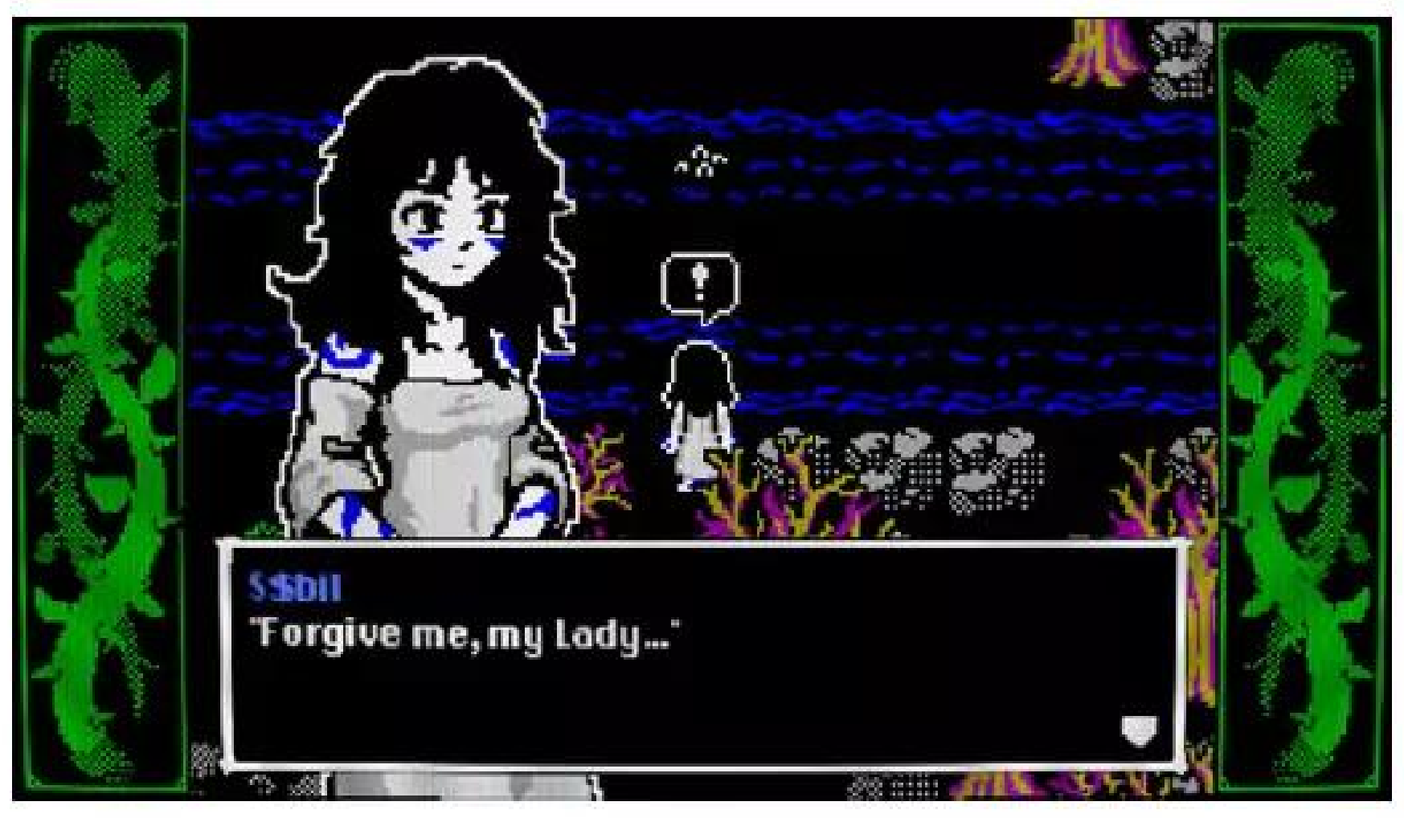
The town often gets together to meet. And squabble.

VERDICT

★★★☆☆

Tales of the Shire has great cooking and foraging systems, but not a lot else to keep you busy

Christopher Livingston



"Forgive me, my lady..."

PRICE Free **PLATFORM** PC
WEB bit.ly/OnesExile

ONE'S OWN EXILE

SURVIVAL AT ALL COSTS.

Games about grim survival usually invite us to make hard choices by killing or betraying other people, but what if the person you have to betray is yourself? That's the question *One's Own Exile* grapples with, as you try to escape a society where difference is feared, and ultimately eliminated.

Sybil, the protagonist, outlines it neatly at the start, saying that she will need to cut her long hair, throw her religious items away, basically destroy all trace of her culture to pass the checkpoint and survive the witch hunt that is coming for her. And that's not even the hardest part, as she contemplates searing away her tattoos. You have these tasks to perform in the town, and every step is horrifying to watch, as parts of Sybil and her culture are torn away until there is almost nothing left.

I haven't discovered all the endings, but this was a powerful story as I erased Sybil's identity and approached the checkpoint with every finger crossed.

VERDICT

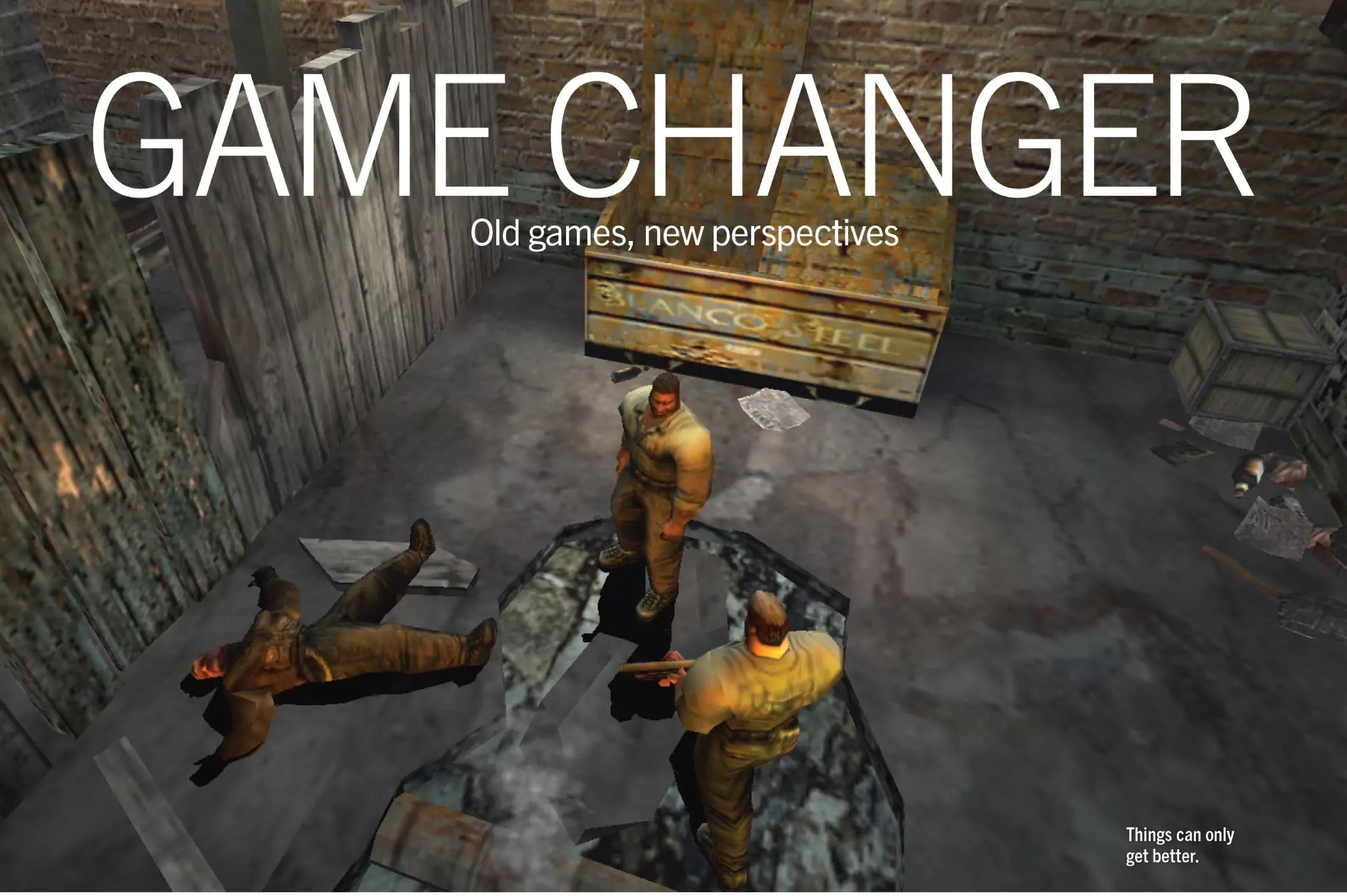
★★★☆☆

A challenging psychological battle with yourself.

Tom Sykes

GAME CHANGER

Old games, new perspectives



Things can only get better.

RELEASE 1999 **DEVELOPER** Xatrix Entertainment **PUBLISHER** Interplay **WEB** steam.com

Kingpin: life of crime

From junkyard dog to king of the urban jungle. By John Strike

Like almost every game I played during the 1990s and early 2000s, my love of brutal FPS *Kingpin: Life of Crime* started with a free demo on a magazine cover disk. Back then, its wall-to-wall bloodletting, prolific swearing and killer soundtrack were like flames to my inner moth.

It's hard to imagine a more exciting time for the genre than in 1999. *Half-Life* had basically just conquered the world the year before, and a trail of breadcrumbs and bratwurst would lead to *Return to Castle Wolfenstein* in 2001. A new FPS was truly exciting back then.

With the hum of *Quake II*'s minigun still ringing in our ears, lesser-known developer Xatrix Entertainment had just finished its first official expansion, *The Reckoning*, and was about to launch *Kingpin: Life of Crime* using the same brilliant engine.

Ultraviolent dreams

"You're aware this game is for adults?" warned the nice lady at the end of the phone, as I casually ordered the full version of *Kingpin* using my mum's bank card. The combination of its graphic violence and the timing of its release, shortly after the Columbine shootings, lead to calls for its cancellation in the US Congress, and ultimately fewer retailers selling the game there.

Xatrix's CEO, Drew Markham, stated at the time, "*Kingpin* was never intended for children. This is a game with mature themes made for a mature audience," which was a sentiment that had reassuringly found its way to me when purchasing the game. Still, putting a big red button in front of 16-year-old me and saying, "Don't press the big red button," obviously made it all the more appealing at the time, and with legendary hip-hop group Cypress Hill leading the soundtrack, this was a game I couldn't wait to get my hands on.

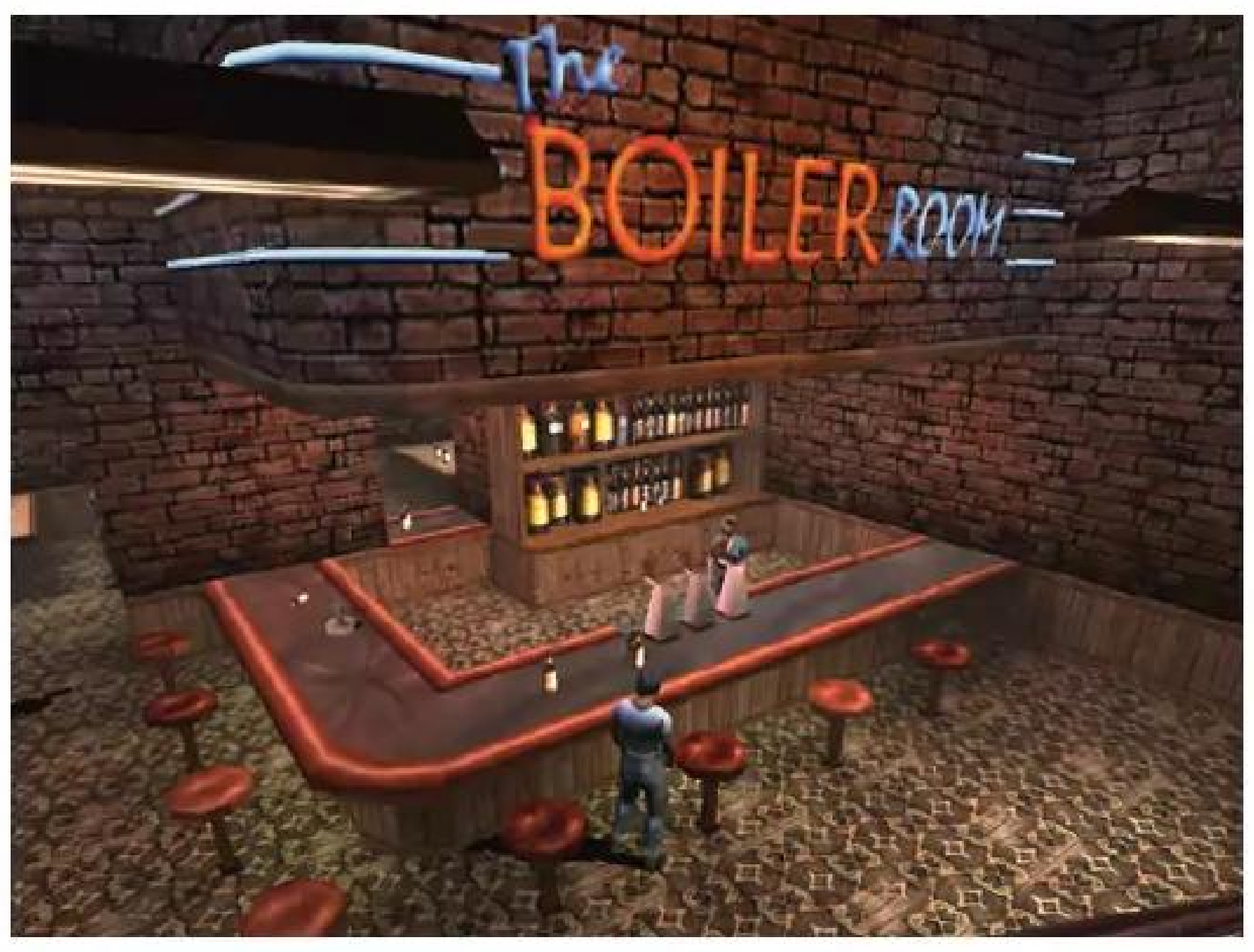
Set across a variety of grim retro-futuristic areas, from slums, through sewers, to industrial sites, train yards and eventually the big city, *Kingpin* is your revenge-fuelled journey from deadbeat to crime boss.

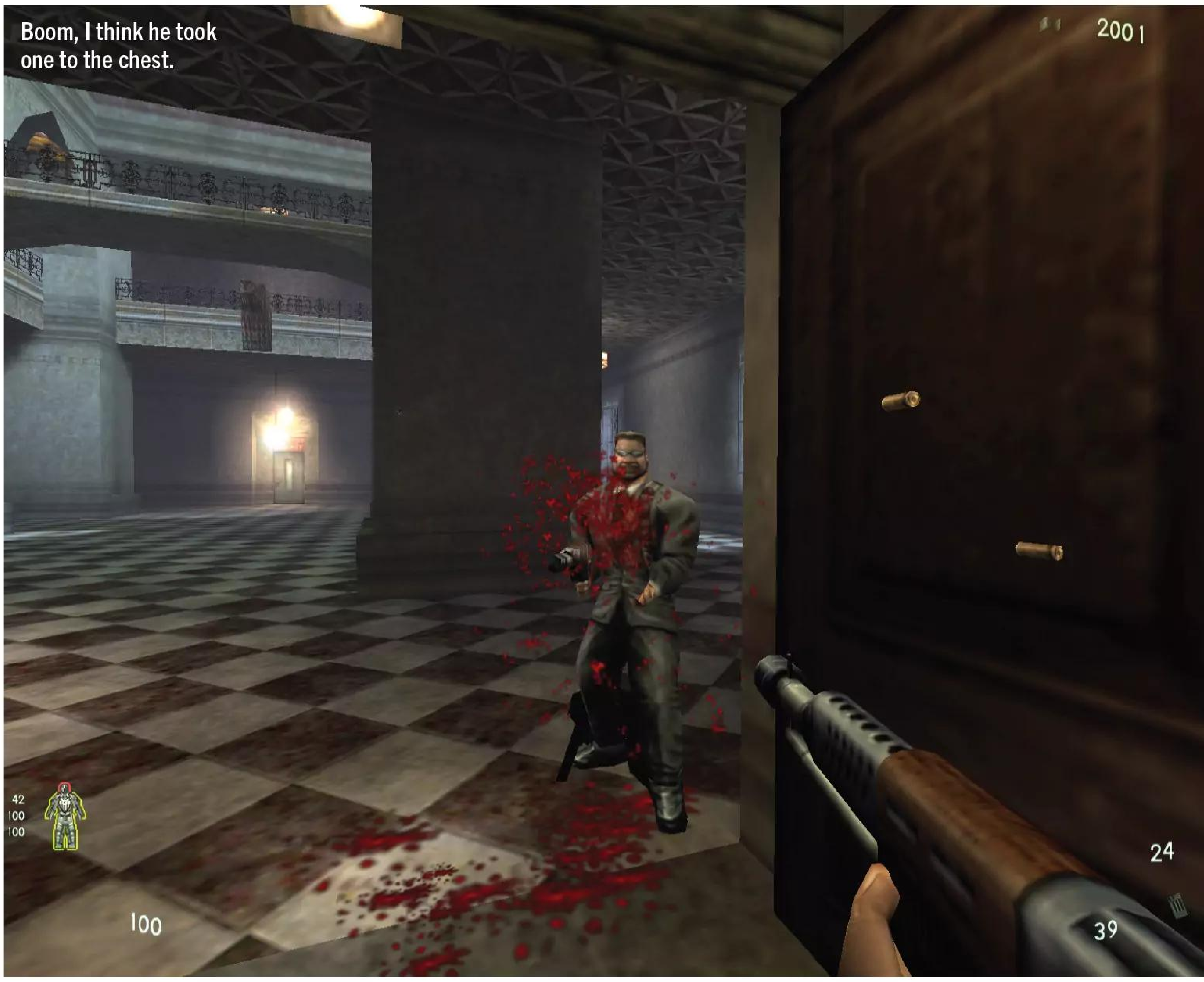
In a similar way to *GTA 2*, it marries a grimy 1930s art-deco style with a feeling of advanced industrial technology. Characters in the game range from bums to thugs for hire, some sporting tattoos and piercings, some clad in bionic-looking masks and armour, and near enough everyone in the game hostile, including the player.

Let it reign

The first few levels are really about establishing a foothold and

BOTTOM Some of the lighting effects have aged really well.




Boom, I think he took one to the chest.

reaching that sweet spot where you've got a cache of ammo, a powerful enough weapon, and plenty of health to ensure success.

That's reflected in the first level which is actually pretty tough, and it feels much more strategic than most later levels. I always wondered if the difficulty of level one was at odds with the reputation of the game, when you believe *Kingpin*'s all about shooting and swearing, and the first 20 minutes require real care, thought and patience.

You begin the game lying down, not in bed, but bleeding and half dead in an alleyway, having been beaten to a pulp by a pair of Nikki Blanco's thugs. Your first line, "I'm gonna bury those two motherfuckers," is a ripper, and there's no looking back from here.

I instantly find a lead pipe and wonder if I've accidentally stumbled into a plumbing simulator, though reassuringly the first vagrant I meet sells me a crowbar for a dollar. The second vagrant I meet threatens to beat the crap out of me for looking at his girlfriend. The third is lying on a mattress in an alleyway, drunkenly gesticulating. I take a closer look just to make sure it isn't Oliver Reed, then he offers information in exchange for whisky.

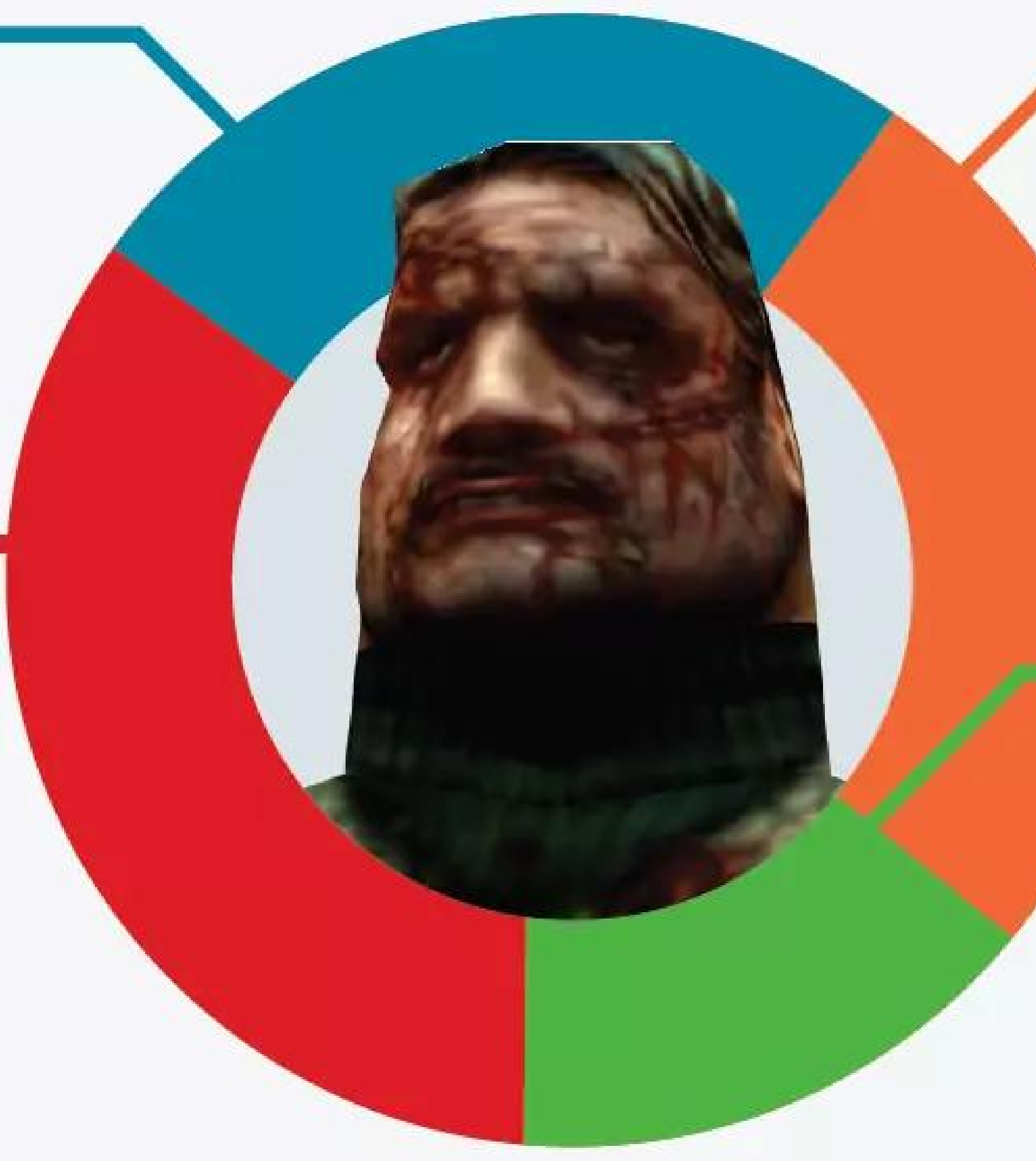
I turn right towards a Heilman Shipping sign, down an alley and immediately stumble into two armed heavies, who simultaneously yell "Rat fucker!" and shoot me to death.

I start again and turn left this time towards a Pawn-o-Matic store, one of many safe places dotted throughout the game where I can buy gun mods, ammo, armour and health. The cigar-smoking shopkeeper offers me a free pistol in exchange for a Heilman condenser coil. I have no idea what that is but my first mission has just begun.

I head back to the alleyway guarded by the pair of meatheads, who I carefully sneak past when the ball game on their radio distracts them. I race through corridors and warehouses to an isolated office, where I'm challenged by a fat bloke who looks like a cross between Jim Royle and Al Capone. He's guarding a juicy-looking safe, so I batter him

BAD SEED

The games running riot in Kingpin's DNA

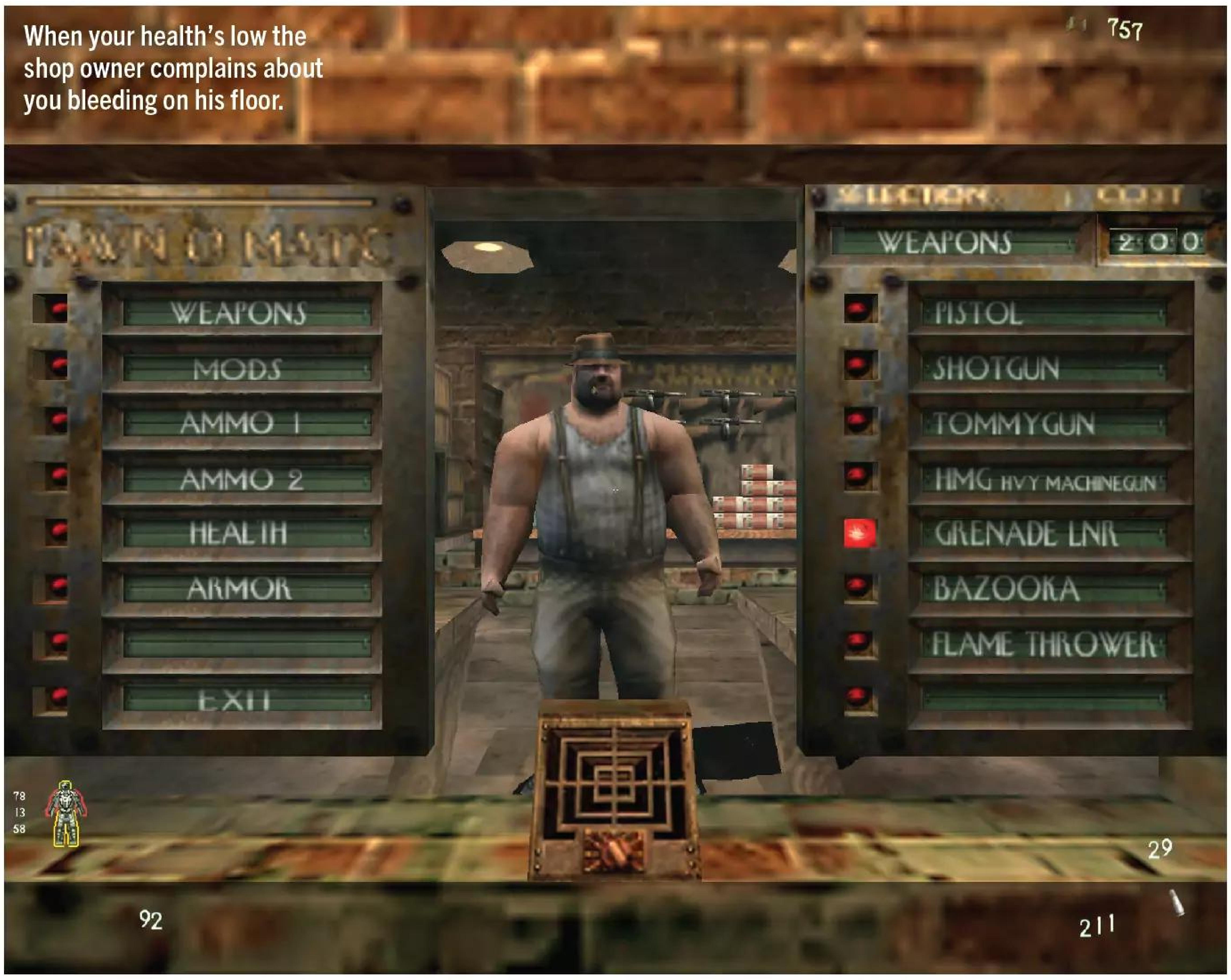


25%
QUAKE II FEEL
Driven by the QII engine, the ambient lightmapping is distinctive throughout.

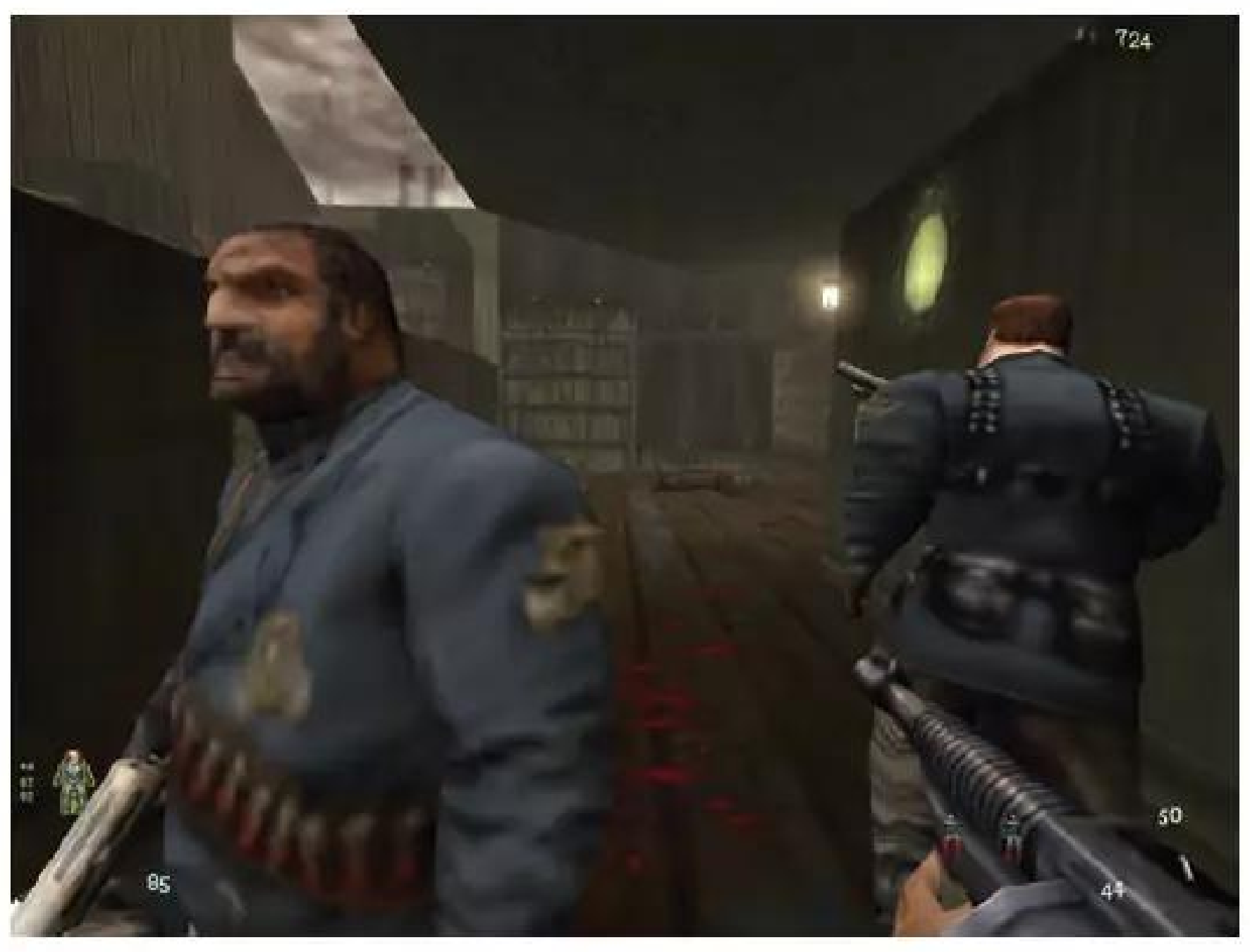
35%
GTA 2 MISSION SYSTEMS
Imagine playing *GTA 2* in first person without the cars. The crazy errands and retro-future vibe reside in both of these games.

25%
REDNECK RAMPAGE PROFANITY
Baddies unnecessarily swearing at you as they shoot you feels familiar here.

15%
SOLDIER OF FORTUNE GORE
Turning someone's head into flying red blocks with a shotgun is a very Raven move.


When your health's low the shop owner complains about you bleeding on his floor.

BELOW Two NPCs on bodyguard duty.



with the crowbar, leaving his hat on the floor and his cigar still puffing away in his mouth.

I haven't got the code for the safe but I grab a bottle of whisky and find the condenser coil, in what's rapidly turning into a really dark shopping errand.

I head back to Pawn-o-matic and pick up my firearm, then reunite the bum on the mattress with his bottle of whisky, before he spills the code for the safe. It's worth sneaking back into the warehouse as there's a sack of dollars waiting in the safe, in addition to the fat dead man. Now I can hire some muscle and buy a magnum mod for the pistol.

My third and final trip back to the two thugs in the alley is with a modified pistol and a hired buddy by my side, who's essentially offered to be brutally shot to death for $10. A profanity-laden gunfight ensues and within moments we're standing in a pool of ketchup, the ball game still playing on the radio.

Though probably the most intricately woven, this is one of many missions that thread through each level of the game. Again, similarly to *GTA 2*, you find yourself running the most bizarre errands to progress through the levels, albeit not from a bird's eye view, and without columns of Elvis impersonators.

The jobs you take range from searching for a car battery, to beating an unruly tenant and his dog to death so you can take a stolen wrist watch back to a grateful landlord.

One of the most memorable missions from later in the game comes after you find Big Willie in a club toilet (behave yourself). His girlfriend, Lizzie, has been kidnapped, so you have to blast your way through her captors until you find her decapitated body on the deck of a boat. In a poignant moment, which is really the only time we see compassion in the whole game, our character mutters, "Look what they did to her." And of course, this is *Kingpin*, so I have to hand-deliver her head to Willie in order to progress.

Red light visions

Originally, *Kingpin*'s developers had a Night City-esque *Blade Runner* vibe planned for the game, but as hip-hop group Cypress Hill came on board, the developers steered the backdrop away from neon lights and Vangelis, and more towards dark urban criminality and street rap.

They provided instrumental backing tracks from their 'Cypress Hill IV' album, including 'Checkmate', 'Lighting Strikes' and '16 Men Till There's No Men Left' that can be played on loop or heard

RIOT STARTER

The descent of a Kingpin conversation

+ **ME**
So what's up?

LAMAR
Hey motherf***** dont be talking to my bitch!

− **ME**
Hey f****** kiss my ass!

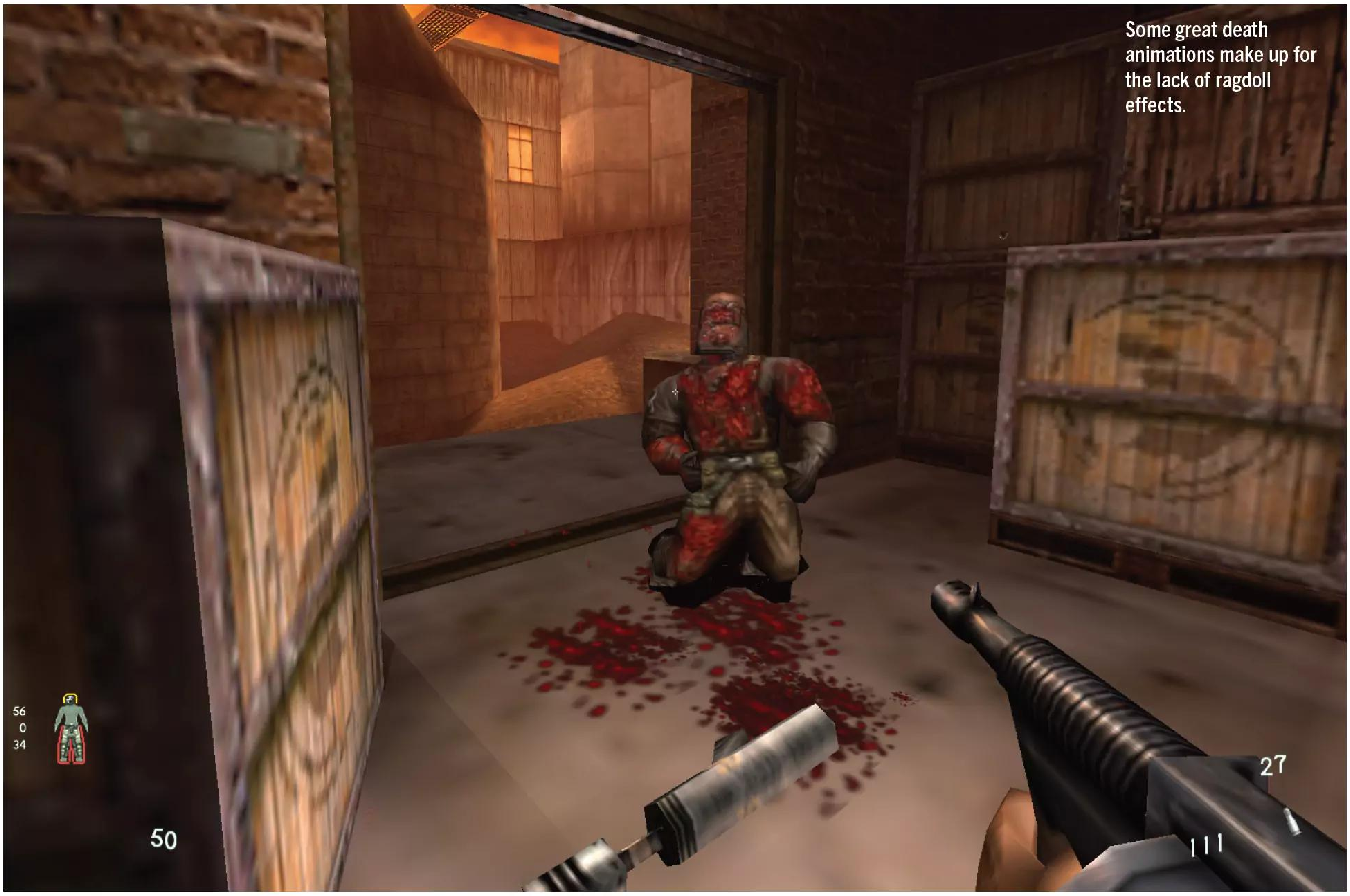
LAMAR
Yo, I said don't be looking at my bitch!

− **ME**
You f****** piece of shit!

LAMAR
You better step the f*** off man!

− **ME**
YOU F****** WANT SOME OF THIS, F***!

LAMAR
DIE MOTHERF*****! *POP, POP, POP!*



Some great death animations make up for the lack of ragdoll effects.

on radios throughout the game. Lead vocalist B-Real, real name Louis Mario Freese, even voices some of the characters. His distinctive tone is used for all of the club door men as well as The Jesus, the tough-as-nails Hispanic street boss surrounded by flesh-eating pit-bulls. There's no doubt the group's influence helped steer the subsequent direction of the game, and the soundtrack helps reinforce the feeling of nostalgia any time I play back through it.

Playing the game today, *Kingpin*'s weaknesses lie in its textures and clunky combat, but the game's spirit is very much alive and ready to play.

It has its surface-level quirks such as the way going near a rat causes the player to shriek in agony, or the way the Pawn-o-Matic shopkeeper denies having any cool guns in the early levels, despite clearly having all of the cool guns lined up on racks behind him. These all fall into amusing niggle territory as *Kingpin*'s positives vastly outweigh its negatives.

Kingpin's USP on release was its high level of violence and profanity, which is understandable given it was one of the first games, even prior to *Soldier of Fortune*, to include dismemberment and pain skins. Retrospectively though, it achieved a lot more than what it became best known for. Indeed there are several mechanics where it quite simply did better than *Half-Life*.

Unlike Valve's behemoth, you can choose positive or negative interactions with NPCs, provoking different outcomes, usually either, "Get me a thing and I'll give you a thing," or, "Fuck you," followed by a firefight, but either way this gave *Kingpin* a unique depth in 1999.

When chatting with characters you can sheath your weapon for a Florence Nightingale approach, launch a verbal tirade and see what happens, or, of course, simply open fire on all them.

The artificial intelligence that drives the NPCs is also remarkably good, particularly when you team up with them. From the first interaction, they'll stop, follow, attack or even crack a safe. Not even *Half-Life*'s lab technicians could crouch down and follow you through air vents or jump across obstacles, and *Kingpin*'s NPCs can, and will, do it all.

No other game in 1999 had you rummaging through a dead man's pockets for money to hire NPCs, trading goods for information, or modifying weapons using stolen cash, all in the same level.

These mechanics are supplemented throughout the game by really neat sounds and audio. The sparks when your safe-cracker blasts open's Nikki's safe are dazzling. The splutter your taxi driver makes when he asks for his 20 bucks and you put a shotgun shell in his face are blood-curdling. Even the, "Awhuhaughugh!" wobbly lip sound you make when you accidentally try and climb an electrified fence is both ludicrous and hilarious.

Case closed

Kingpin's only real crime is its length, at around a disappointing three hours for a full play through. Slipgate Ironworks released a Reloaded version of *Kingpin* on Steam in 2023, but the purist in me only has eyes for the original, and it seems there's more entertainment to be garnered from reading Reloaded's reviews than there is playing it. ■

RETRO

Inspirational stories from computing's long-distant past

PRICE Around $300 **WEB** ebay.com

VERDICT

★★★☆☆

LEFT The PCW 8256 was nicknamed "Joyce" after Alan Sugar's secretary.

Amstrad PCW 8256

David Crookes takes a look at the first entry in Amstrad's biggest-selling computer series from the 1980s.

Right now, one of those memory erasers from the *Men in Black* movies would be a godsend. It would allow me to wipe clean the computing knowledge I've accumulated over the past 40 years and approach the computer in front of me from the perspective of someone who has never so much as touched a keyboard.

After all, the Amstrad PCW 8256 was squarely aimed at first-time computer users whether they were at home or in the office. How nice it would be to view it in the same way that so many others did following its release in 1985. Instead, I'm left wondering if this machine is going to be capable of igniting my curiosity and imagination. It was, to put it bluntly, never intended to be exciting.

Amstrad never made any promises of cutting-edge technology; no ambition to be a wonderful all-rounder. Rather, the 8256 simply offered something to look at, something to press and something to splash ink on to pieces of paper – and yet that combination of screen, keyboard and printer proved more than sufficient for so many people. As Amstrad boss Alan Sugar always believed it would, the PCW 8256 succeeded in changing the face of office work.

Lord Sugar, as he's now known, had the idea when he was flying between Tokyo and Hong Kong. He sketched his plan on the back of a Cathay Pacific serviette and he imagined the creation to have a monitor with a printer stuck to the top. That idea was sensibly ditched in favour of separate units, but the concept of a word-processing machine to compete against electronic typewriters stuck. And while Lord Sugar was never a visionary in the mould of Steve Jobs, he had a knack of knowing what would sell.

By this point, Lord Sugar had experience in the computer market. His CPC 464, 664 and 6128 computers – the first one being tape-based, the latter two using disks – were shifting many units and Amstrad, far from suffering the huge financial losses of its competitors, was making healthy profits.

Lord Sugar knew he was on to a winner, mimicking the strategies that had served

> "There was no pity, no laughter, just a shrug. And that was because the machine came and went so quickly it barely had time to ignite its fire, never mind burn rivals that arrived before and after it."

him well when building hi-fi units– namely, providing the "masses" with everything they would need from a computer at that time. He ensured the components would be connected with as few leads as possible, allowed the whole shebang to be powered with a single plug and wanted users to make headway in no time.

He also believed he could deliver his new product at a price that would instantly prove attractive to potential computer users who were put off by the high cost of investing in an office-ready machine such as the IBM Personal Computer . That cost thousands of dollars, while the PCW 8256 went on sale for $799.

For the money, buyers would not only get the aforementioned hardware (with a 3in disk drive built into the monitor and 256K of RAM) but useful software, too. The bundle included the CP/M operating system, BASIC, Dr Logo and, crucially, a word-processing package called LocoScript.

The range went on to sell eight million units. To put that in perspective, the Apple II sold six million and the ZX Spectrum sold five million. The series even became the best-selling British computer and held that title until the Raspberry Pi topped it in 2016.

Big expectations

I bought my machine on eBay. I cleared the boot and the back seat of my car, drove a good 40 kilometres to pick it up and expected to come back with a hulk of electrical equipment and wires. As it was, the seller passed me a box that took up less than half the boot space, maybe only a shade more than a third. Being the fool that I am, I took it on trust that everything was in there... thankfully, it was.

After unpacking the box, it took less than two minutes to set up the computer. As Lord Sugar envisaged, the process couldn't have been simpler. The keyboard plugs into the side of the monitor, the printer into the back. As the power lead is fixed to the monitor, it was now simply a case of plugging it in and pressing the button on the front of the display.

The green screen monitor went, er, green and, well, nothing happened. Okay, not quite nothing. The printer whirred for a second or two. But I wasn't worried. I figured I needed to power it up with the floppy disk that came with the machine and, once inserted (the disks are double-sided), I had CP/M sitting pretty on the screen.

AMSTRAD
PCW8512 Printer

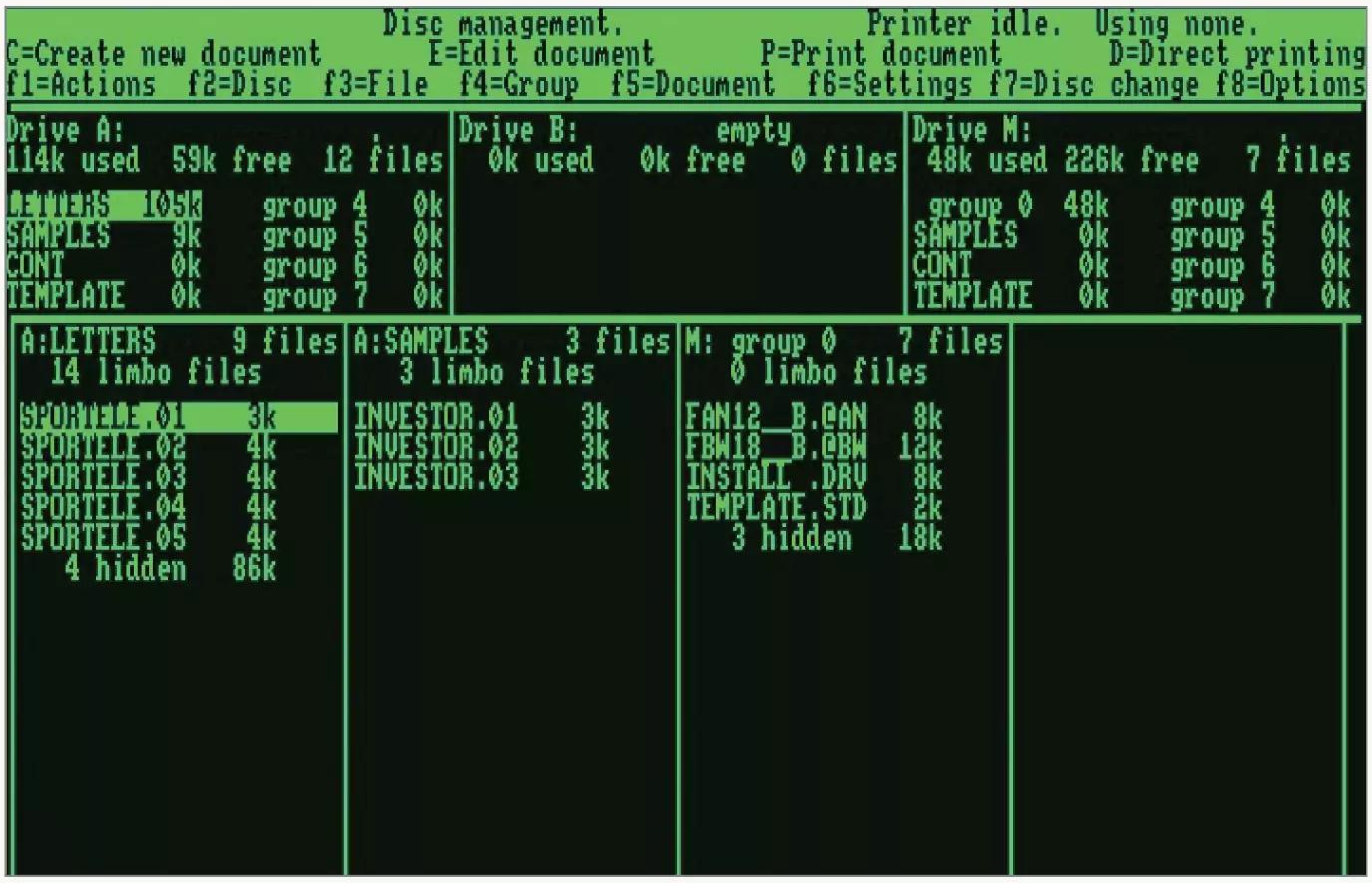
ABOVE You can still buy replacement ribbons for this printer online.

Now, of course, this instinct may not have kicked in without some prior computing knowledge but, as I later discovered, the spiral bound user guide would have had me covered. It started with the words "Don't switch on yet!", written large across the top of the first page (whoops!), but the important step was clearly shown on pages four and five. And the wording of those instructions hit home just why Amstrad's computer became a roaring success.

The manual assumed the user knew absolutely nothing about any aspect of computing. It went as far as explaining how to hold the disk – "by its labelled end" – and how hard to place it into the drive ("gentle pressure" and "whatever you do, don't force it").

The home of technology

techradar.com



```
                Disc management.                  Printer idle.  Using none.
C=Create new document      E=Edit document      P=Print document      D=Direct printing
f1=Actions  f2=Disc  f3=File  f4=Group  f5=Document  f6=Settings f7=Disc change f8=Options
Drive A:                     Drive B:        empty      Drive M:
114k used  59k free  12 files  0k used   0k free   0 files  48k used 226k free   7 files

LETTERS   105k    group 4   0k                             group 0  48k    group 4   0k
SAMPLES     9k    group 5   0k                          SAMPLES      0k    group 5   0k
CONT        0k    group 6   0k                          CONT         0k    group 6   0k
TEMPLATE    0k    group 7   0k                          TEMPLATE     0k    group 7   0k
 A:LETTERS      9 files A:SAMPLES      3 files M: group 0     7 files
   14 limbo files          3 limbo files           0 limbo files

 SPORTELE.01      3k    INVESTOR.01    3k       FAN12__B.@AN    8k
 SPORTELE.02      4k    INVESTOR.02    3k       FBW18__B.@BW   12k
 SPORTELE.03      4k    INVESTOR.03    3k       INSTALL .DRV    8k
 SPORTELE.04      4k                            TEMPLATE.STD    2k
 SPORTELE.05      4k                               3 hidden    18k
    4 hidden     86k
```

ABOVE The LocoScript main screen lets you create, view, edit and print your documents.

But it wasn't patronising. While it may feel like that today, back then this would have been hugely refreshing. It cut through the mystique of computers and showed them to be approachable, useful tools. There were even tips on how to clean the thing. The more I read the manual, however, the more I realised there was a reasonable amount of power waiting to be unleashed.

Inside job

Now, I haven't unscrewed the panel from the back of the monitor. For the purposes of this review, I didn't want to tinker and mod the machine, just use it as intended out of the box. But from watching videos and reading past articles, it's apparent that there are very few computer components running the PCW.

Strip away the monitor tube and high-voltage electronics and you're left with a tiny PCB containing 17 chips. There's a Zilog Z80 processor running at 4MHz, an 8041 printer controller chip, an NEC 7658 disk controller, a large gate array and eight chips for the 256K RAM. A further five chips are TTL drivers for the printer interface.

The reason nothing happens when you turn the machine on without a disc in the drive is because every program – including the OS, CP/M Plus – needs to be loaded from a disk. When you insert the CP/M Plus disk, a short program on the 8041 printer controller chip copies the boot code into RAM for execution. If you don't have disks for the machine, you've got little more than a door jammer.

At the very least, if you're considering buying a PCW 8256, you'd want that CP/M Plus system disk. It enables you to perform all of the basic (and a lot of advanced) functions expected of a computer. You'd use it to work with files, whether you're creating, copying or renaming them. CP/M Plus will also allow you to format, copy and list files stored on disks.

The system disk includes the GSX graphics library and developer tools such as the macro assembler MAC and the SID debugger. You also get access to the speedy, business-oriented Mallard BASIC interpreter produced by Locomotive Software, which has very similar syntax to Microsoft's MBASIC 5.2 – perfect for writing your own programs. If you have the full set of two bundled PCW disks (I only received one), you get Digital Research's Dr Logo programming language, too.

Importantly, the system disks include LocoScript and that's the whole essence of what the PCW is about (the "W" stands for word processor). It hadn't escaped Amstrad's notice that, apart from games, word processing was the main thing people used their computers for, and it just so happens that LocoScript is excellent.

Voyage of disk-overy

Before I delve into LocoScript, we need to talk software. One of the key problems I've found these past few weeks is poor availability of commercial software on disks, even on eBay. They're often expensive, too: don't expect to pick up software for a pound or two.

To that end, if you're serious about using this machine on a regular basis, then you should consider a Gotek. This floppy drive emulator uses virtual disk images (the ideal model is an SFR1M44-U100K). You can install a Gotek in the second slot on the Amstrad PCW 8256 monitor – the one that doesn't have the floppy drive in – by opening the back, removing the plate that has a few words on it ("green monitor") and making the connections.

Once done, you can load up a USB stick with a stack of software, insert it into the Gotek before pressing buttons to select the files you need to run on the PCW. Given that Goteks can be picked up for about $100, it makes a lot of sense.

So what is available? Well, the PCW has an abundance of software, from database apps such as dBase II to spreadsheets such as SuperCalc II, plus numerous apps released into the public

BEAB Approved
WARNING! HIGH VOLTAGE
SED

BELOW The computer is concealed inside the monitor rather than as a standalone unit.

domain. You can also get to grips with desktop publishing using MicroDesign or Stop Press, or take charge of your finances with the likes of Sage's Popular Accounts.

Having CP/M Plus as the operating system means the machine is open to a large number of CP/M programs developed for other computers capable of running this OS, and gets around the fact that a good number of those were sold on 3.5in floppies. With a Gotek drive installed, you'll also have few problems getting hold of games (just remember that, in all cases, it's illegal to download ROMs without permission from the copyright holder).

Anyway, the PCW had a decent sized library of titles, including *Head over Heels*, *Match Day II* and *Trivial Pursuit*. If you love text-based adventures, you'll be well served with games by the likes of Level 9 and Infocom. These work especially well with the PCW's green screen monitor since they don't need flashy graphics.

Steaming ahead

For all of that, word processing was always the main attraction of the PCW, and to some extent it still is. The good news is that, while you could obtain the likes of SuperWriter, WordStar and Protext, LocoScript is more than capable of bashing out letters, essays and novels; and as it was written specifically for the PCW, it really does bring out the best in the computer.

For starters, it makes good use of the (cramped) keyboard with its specific word processing keys such as cut, copy and paste. You can press keys to find and exchange text; move through your prose by character, word, paragraph and page; and delete forward and back. The software also seeks to make life as easy as possible by having most functions within a series of pull-down menus activated by the function keys. But it's not as intuitive as you may think.

As the manual says, "there is no short cut to learning LocoScript". But if you quickly work through the 100 pages dedicated to the app, it will become second nature. It helps that there are templates to play around with while you get to grips with what LocoScript can do. You may even become used to the fact that the Return and Enter keys perform entirely different functions.

In essence, though, it's a word processor running directly on the machine (not via CP/M) that provides staple formatting, justifying and editing tools. It supports word wrapping, displays headers and footers, and allows use of an area greater in size than the screen. And if you delete a file by mistake then it sits in limbo: so long as you don't keep overwriting the disk, you can get it back.

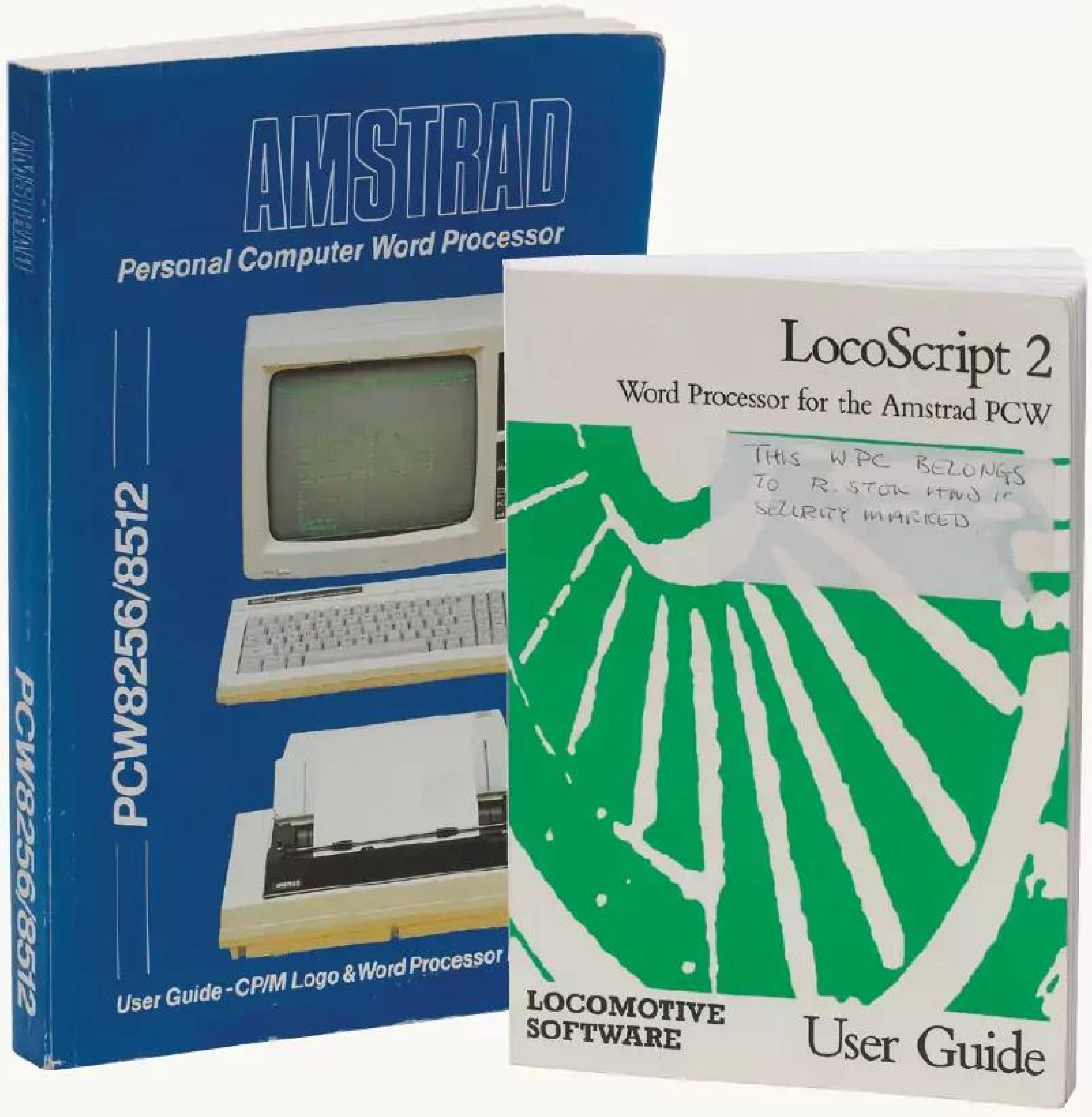
Green Monitor
Personal Computer Word Processor

ABOVE The 8256 has one disk drive while the subsequent 8512 had two, as well as twice as much RAM.

LocoScript also makes optimum use of the 12in monitor, which has 90 columns by 32 lines. That's more than the CP/M standard of 80 by 24, but the popularity of the PCW meant that some, but not all, CP/M programs made use of the extra space.

Of course, given there's a 9-pin dot-matrix printer attached to the computer, I was eager to find out how that performed. I used A4 paper, but there's an option to use tractor feed paper, too. In LocoScript, I opted to save and print, but it's possible to press the Ptr key to make use of a menu. Once the paper was fed, the printer sprung into action, and there it was: a printed page.

It didn't take long. Draft quality mode rattled off my document at 90 characters per second and added the various onscreen elements such as bold and italics. A subsequent re-print in high quality was slower (20 characters per second) but it resulted in near-letter-quality output and something I would consider sending to someone.


AMSTRAD
Personal Computer Word Processor
PCW8256/8512
User Guide - CP/M Logo & Word Processor
LocoScript 2
Word Processor for the Amstrad PCW
THIS WPC BELONGS TO R. STOK AND IS SECURITY MARKED
LOCOMOTIVE SOFTWARE
User Guide

BELOW The Amstrad user manual was aimed at people who had never used a computer before.

I particularly enjoyed the direct printing mode. This works like a typewriter in that you hammer on a key and it's outputted to the printer in real-time. It's supposed to be good for filling in forms and I can see that working well, especially given that you can use the cursors to position the print head in the right spot.

If you don't like the printer, however, be aware that it's integrated into the PCW setup. That's not entirely a bad thing because it ensures everything works seamlessly, but it can feel restrictive. Amstrad supplied an extension unit allowing the use of Centronics parallel and RS-232C serial ports, but you'll have a hard job finding one of those today.

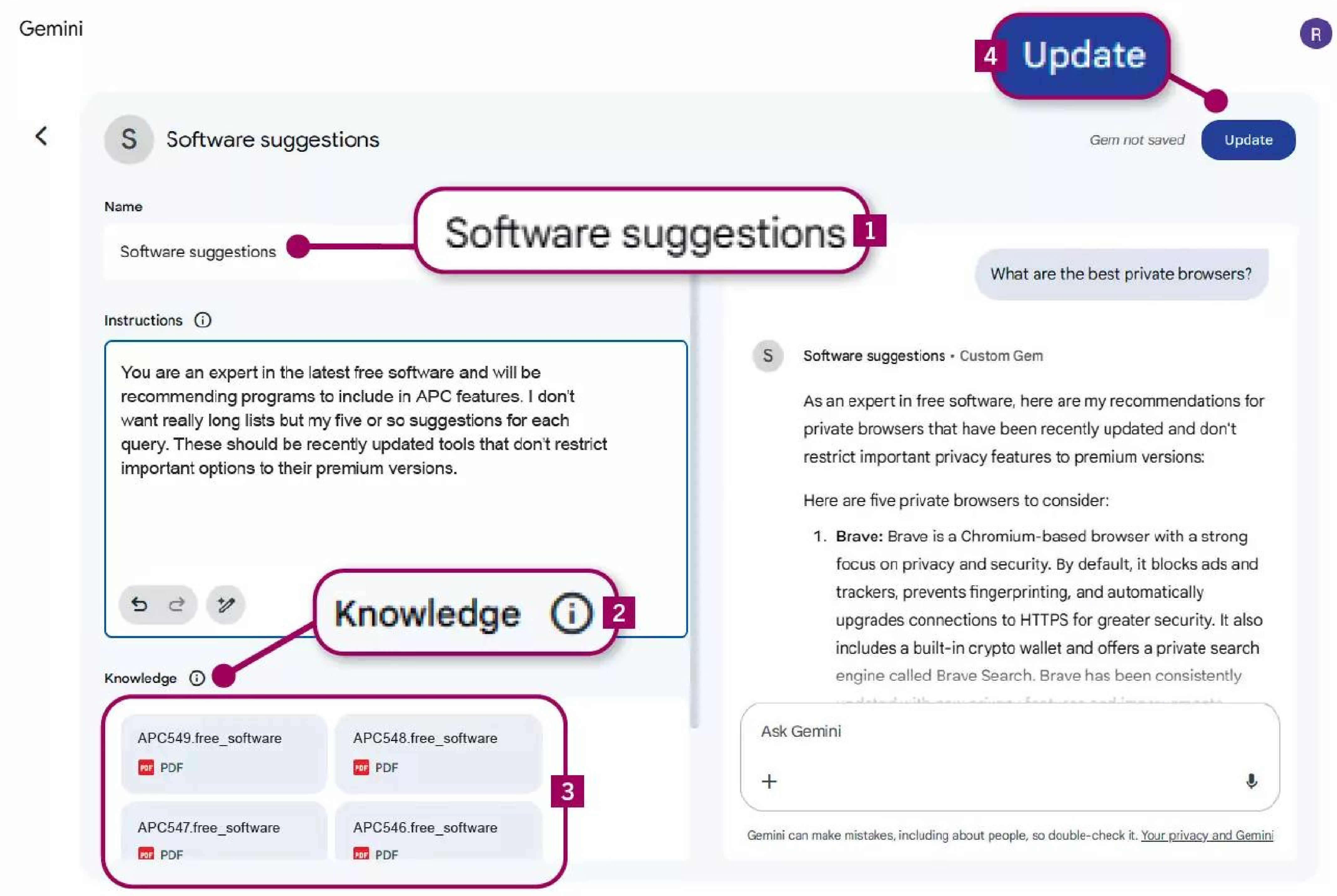
Fresh eyes

Again, though, I wish I'd have been able to approach this computer with a blank slate; to be mesmerised by what it could do without any preconceptions of what I'd have liked it to be able to do. While the Amstrad PCW 8256 has the capacity to surprise a newcomer, it feels like a step back from even the computers I was enjoying as a child. I was curious to keep probing but, generally, it was a case of loading up applications rather than playing around.

Yet that was the point. The PCW's USP was its bundle of hardware and software for a killer price, giving users an inexpensive and easy way into computing with specific tasks in mind. It's telling that this focused approach means people today don't have the same pangs of nostalgia for the machine as they do for its rivals. One thing is clear. If you're going to be splashing out a few hundred dollars for a PCW 8256, there are many more exciting retro machines to dabble with. ■

Hoping to make his interactions with Google Gemini more useful, **Robert Irvine** tries to…

Create his own AI chatbot



You are an expert in the latest free software and will be recommending programs to include in APC features. I don't want really long lists but my five or so suggestions for each query. These should be recently updated tools that don't restrict important options to their premium versions.

What are the best private browsers?

Software suggestions • Custom Gem

As an expert in free software, here are my recommendations for private browsers that have been recently updated and don't restrict important privacy features to premium versions:

Here are five private browsers to consider:

1. **Brave:** Brave is a Chromium-based browser with a strong focus on privacy and security. By default, it blocks ads and trackers, prevents fingerprinting, and automatically upgrades connections to HTTPS for greater security. It also includes a built-in crypto wallet and offers a private search engine called Brave Search. Brave has been consistently

Gemini can make mistakes, including about people, so double-check it. Your privacy and Gemini

Robert used Gemini's free Gems feature to create and customise his own AI chatbot.

After writing so much about AI in the last few months, I took a break from talking to ChatGPT, Claude and the rest, and spoke to some real people. Not for too long, mind: just enough to order drinks at the bar and a bag of chips on the way home.

However, I couldn't resist the urge to chat to Google Gemini, which so impressed me during my testing. But my random – and perhaps slightly inebriated – prompts produced a strange, stilted conversation that I deleted from embarrassment the next morning.

I then realised I hadn't dug deeply into Gemini's Gems option (**gemini.google/overview/gems/?hl=en**), other than a brief mention in our feature. Gems lets you create your own personal chatbots. Like ChatGPT's custom GPTs, these perform specific types of task, so you can keep your chats focused and not veer into messy rambles. It also means you don't have to explain what you want every time you enter similar prompts. Best of all, since March, Gems has been available to all Gemini users – without a subscription.

I therefore decided to find out how simple it would be to set up my own 'gem', with no coding skills or much imagination. I frequently have to check past issues of *APC* to see which programs we've recommended, so I figured my chatbot could specialise in suggesting free software.

To get started, I opened the Gemini app on my Android phone (**tinyurl.com/APC550gemini**), tapped my profile icon and chose 'Gem manager'. Here, Google had thoughtfully provided five of its own gems, including Brainstormer ("fresh ideas for parties, gifts, businesses and more"), 'Career guide' and 'Learning coach'. But to create my own chatbot (which would hopefully be more useful than Google's rather corporate examples), I was directed away from the Gemini app to access the New Gem page in my browser at **gemini.google.com/gems/create**.

This online tool told me to give my gem a name. I toyed with 'Gerald', before concluding that wasn't sufficiently descriptive, so plumped for the duller but more accurate 'Software suggestions' (**1** in our screenshot). Gemini automatically updated its Preview pane to show my new chatbot's name.

Next, I entered instructions for the gem, to tailor the type of tasks I wanted it to perform, along with its required level of knowledge and the quality of answers I expected. Gemini suggested I try a sample prompt to test the chatbot, so I asked it to recommend the best private browsers. I was pleased to note its response adhered to my strict instructions, while still being reliable and informative.

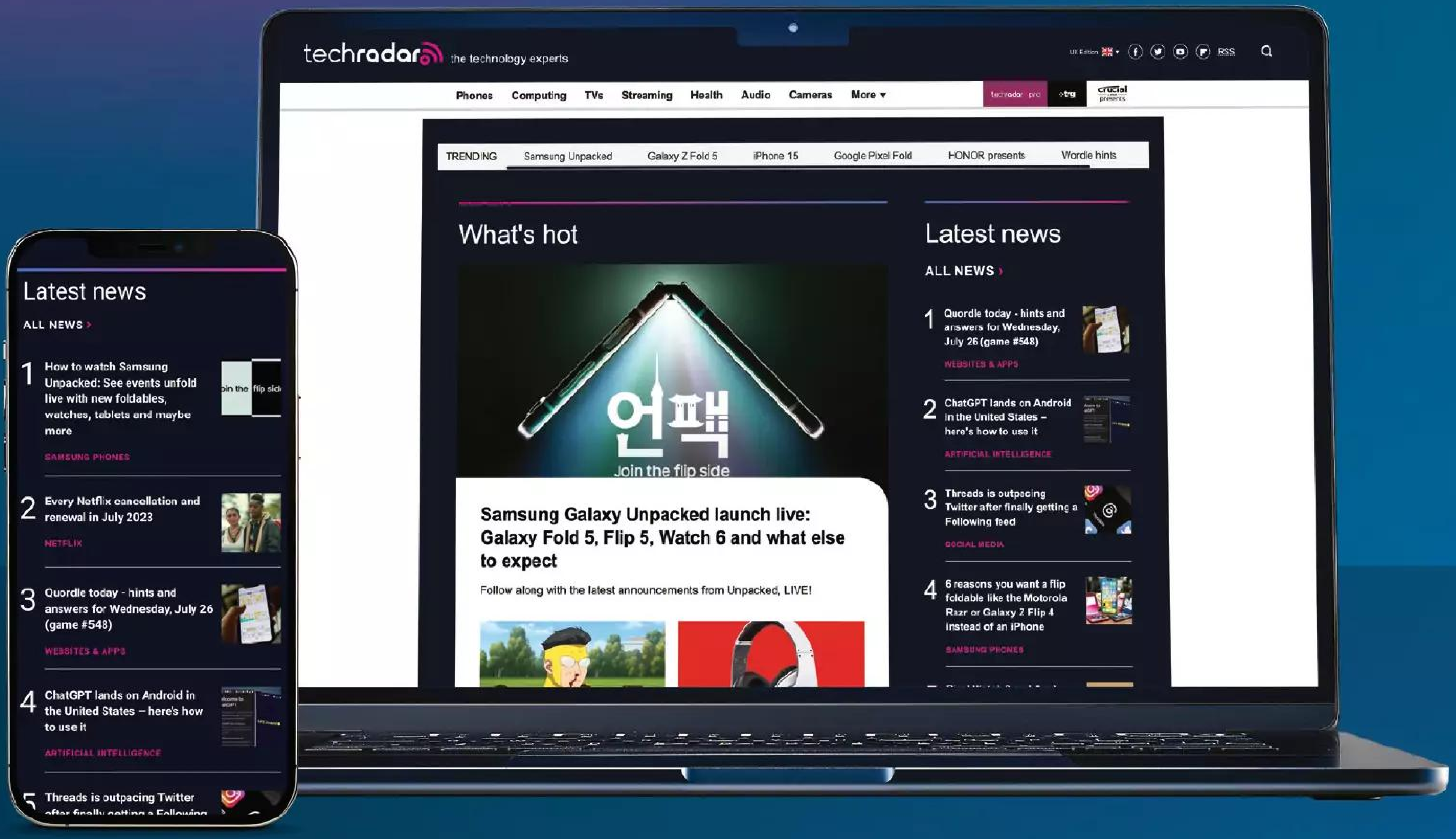
I clicked Save to create my 'Software suggestions' gem, then saw I could make its answers even more relevant. Gemini has a clever Knowledge option **2** that lets you upload up to 10 files for the chatbot to use for reference. I selected a handful of PDFs of software-themed articles **3** and clicked Update **4** to feed the new knowledge to my gem. Sure enough, its subsequent answers referenced previous software recommendations without me needing to look them up myself.

My new chatbot appeared in the Gems list in Gemini's web interface and mobile apps, giving me instant access to its expertise. It's since been joined by more gems I've made that provide recipe ideas, plan days out, and – somewhat inevitably – generate pictures of animals with hats on.

Gems couldn't be easier to create, and save you wondering what you were thinking (or drinking) when you revisit your chats later. ■

> "This online tool told me to give my gem a name. I toyed with 'Gerald', before concluding that wasn't sufficiently descriptive, so plumped for the duller but more accurate 'Software suggestions'"

Meet the technology experts


techradar the technology experts
Phones
Computing
TVs
Streaming
Health
Audio
Cameras
More
TRENDING
Samsung Unpacked
Galaxy Z Fold 5
iPhone 15
Google Pixel Fold
HONOR presents
Wordle hints
What's hot
Join the flip side
Samsung Galaxy Unpacked launch live: Galaxy Fold 5, Flip 5, Watch 6 and what else to expect
Follow along with the latest announcements from Unpacked, LIVE!
Latest news
ALL NEWS
1 Quordle today - hints and answers for Wednesday, July 26 (game #548)
2 ChatGPT lands on Android in the United States – here's how to use it
3 Threads is outpacing Twitter after finally getting a Following feed
4 6 reasons you want a flip foldable like the Motorola Razr or Galaxy Z Flip 4 instead of an iPhone
Latest news
ALL NEWS
1 How to watch Samsung Unpacked: See events unfold live with new foldables, watches, tablets and maybe more
2 Every Netflix cancellation and renewal in July 2023
3 Quordle today - hints and answers for Wednesday, July 26 (game #548)
4 ChatGPT lands on Android in the United States – here's how to use it
5 Threads is outpacing Twitter

- The world's **most** comprehensive technology website
- An **unrivalled** mix of news, opinions, reviews and features
- **All-new design**, new homepage, new features and special reports
- Backed by **over 300 years** of editorial experience

techradar
the technology experts

www.techradar.com

BenQ

Fitting Perfectly to Your Every Need

Monitors for All Spaces and Uses

iF DESIGN AWARD 2025
apc EDITOR'S CHOICE

PD2730S

27” 5K Thunderbolt 4 Designer Monitor

Pixel Precision Makes Inspiration Come Alive.

The BenQ PD2730S is a 27” 5K monitor for designers, delivering Retina-class clarity (218 PPI), 98% P3 colour accuracy, 2000:1 contrast and factory calibration - all on an ergonomic stand which is included with the monitor. Equipped with Thunderbolt 4 (90W power delivery), daisy chain connectivity, and a Wireless Hotkey Puck for easier OSD adjustments, it’s tailored for creative pros like VFX artists and designers.

PANTONE® Validated

PANTONE™ SkinTone™

calman VERIFIED

GW2790QT

27” 2K USB-C Eye-Care Monitor

Balance work and life efficiently and easily.

BenQ’s 27” GW2790QT is a QHD (2K) USB-C Eye-Care monitor perfect for home and office use. It features daisy-chain capability (via DisplayPort), 2x 2W noise filter speakers and noise-cancelling mic, ergonomic stand and multiple picture mode options including Coding and ePaper. The built-in Eye-Care Technology consists of a flicker-free panel, low blue light options, and Brightness Intelligence – automated brightness adjustments for the most comfortable viewing experience.

eye-care

Brightness Intelligence

ePaper mode

9037

Visit **www.benq.com/en-au/monitor.html** for more information